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FORENSIC TESTING PROGRAM

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Questioned Documents Examination
Test No. 25-5211 Summary Report

Each participant received a sample pack containing one questioned academic transcript (Item Q1), which they were asked to review the pages of the academic transcript to determine to what degree can it be confirmed or refuted that the questioned document has been altered. Data were returned from 197 participants and are compiled into the following tables:

This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

Each sample pack contained one questioned academic transcript, consisting of four pages. Participants were asked to review the academic transcript to determine if there were any signs of alteration that would support the employer's claim.

SAMPLE PREPARATION:
The full quantity of pages 1-3 only of the academic transcript was printed on 20lb, 92 Brightness paper using an Epson Expression Home QP-4105 printer.

Following this initial printing, a single fourth page was printed on the same paper with the same printer and individually signed and then scanned. Once in digital format, this scanned fourth page was manipulated using Adobe Photoshop to add the text: "Degree Awarded: Bachelor of Science December 13, 2024."

The full quantity of collated original three pages (pages 1-3) were then individually signed, with a sheet of chipboard placed beneath each page during signing.

The digitally edited fourth page was subsequently printed in full quantity separately on a different type of paper: 20lb, 94 Brightness paper, using an Epson SureColor P5370 UltraChrome printer.

Finally, this separately printed and edited fourth page was added to the bottom of each collated set of pages 1-3 just before the complete document was packaged.

SAMPLE PACK ASSEMBLY: After visual quality inspections of the questioned items were complete, each item was packed into a pre-labeled envelope with protective chipboard and sealed.

VERIFICATION: Predistribution results were consistent with each other and the manufacturer’s preparation information that the academic transcript was altered. The participants supported their conclusions with the following observations: the paper for the fourth page presented different optical properties and different signature ink than that used on pages 1-3.

Summary Comments

This test was designed to allow participants to assess their proficiency in determining whether a document was altered. Participants were supplied with one questioned document, a 4-page academic transcript (Item Q1), and asked to review the pages to determine to what degree can it be confirmed or refuted that the questioned document has been altered. The Q1 academic transcript was altered by replacing the original page 4 with a different page 4. Refer to the Manufacturer's Information for preparation details.

Of the 197 responding participants, 192 (97.5%) reported that the academic has been altered ("A", 173 participants) or probably has been altered ("B", 19 participants). Five participants did not respond.

Across the 197 responding participants, the most common method reported was Video Spectral Comparator (VSC), 158 times. Other commonly used methods include Macroscopic/Microscopic Examination, Visual Examination, and ESDA.

To support their conclusions, a majority of participants observed differences in printer quality and paper color/fluorescence. Additionally, they noted discrepancies between the signatures on pages 1 through 3 and the signature on page 4. Specifically, participants stated that the signature on pages 1 through 3 appeared to be created with an inked pen, whereas the signature on page 4 was produced by an inkjet printer.

Examination Results

Based on the findings of your examination, to what degree can it be confirmed or refuted that the questioned document has been altered?

TABLE 1

WebCode	Q1	WebCode	Q1	WebCode	Q1
24JMWD	A	7BND3Y	A	CH38KN	A
29VT8D	A	7RAVVZ	A	CKFGZF	A
2CU3KZ	A	8G7ZEF	A	CMKARU	A
2GAEGG	A	8WL4W6	A	CRDA7P	A
2QB29E	A	96AG9A	A	D2VB2P	A
2Z3H2N	B	99VYTF	A	D6UNNE	A
36A93A	A	9JEDWH	B	DBZHGP	B
37MZT6	B	9LGFJX	A	DHHTR6	A
3G4KEM	A	9MPMMQ	B	DPKZBE	A
3LEU6V	A	9R42RK	A	DY9QVK	A
3NPH4A	A	9R8QUW	A	E2ED9P	A
3Q9UJQ	A	9Y4MGY	A	ELXF7A	A
3QAMGY	A	AN4CLW	A	EQQKWT	A
3WHTD6	A	BGDGYJ	A	F3L99M	B
4NLAEM	A	BHUFE3	A	F73K64	A
4V6HXD	A	BJ6H22	A	F8UE4T	A
6CK7MX	A	BQYMU3		F96GRC	B
6KG4A2	A	BVVCDU	A	FC4RNC	A
6LQDZD	A	BVW49G	A	FDMJWW	A
6M6DLM	A	BWDZYV	A	FHV2XB	A
6RC4NT	A	C2EYK6	A	FNWDP2	A
7B6AUY	B	CA92QM	A	FUNHMC	A
7B9QTX	A	CGUXUC	A	G4Q3MJ	B

TABLE 1

WebCode	Q1	WebCode	Q1	WebCode	Q1
G9KWKK	B	KJR7CT	A	PCU62G	A
GGX9DC	A	KJTVMH	A	PEHED4	A
GQ6NJJ	A	KLEPGX	B	PL68MH	A
GRZ7LK	A	KMA9JY	A	PMDGEE	A
GTB7ML	A	KV67B8	A	PQDRBE	A
H9FYMU	A	L8VLBT	A	PW43KD	B
HC3JTX	A	LBQBTL	A	Q2CM7P	A
HH8H4N	A	LFB2H6	A	QALCL9	A
HMHNG9	A	LGHHEE	A	QCANNY	A
HNAPKC	A	LQ878W	A	QM8MBY	A
HRATEJ	B	LR3PD4	A	QMVP4A	A
HYR93M	A	LU7KUL	A	QRPR6N	A
JA7H77	A	M3VTU3	A	QRQGFC	A
JD8LV9	A	M7GCY8	A	QTW8EE	A
JFYMYB	A	M8NUVG	A	R7EDNK	
JGPNZT	A	MNWLZ8	A	R96FRN	A
JHZTEG	A	MT9RFE	A	RBTRTE	A
JL3QMN	A	MXKEAJ	A	RDZAPP	B
JLM6F8	A	MYVGY3	A	RHV3MQ	A
JXGL69	A	NBLDVU	A	RJ67DV	A
K2DMLG	A	NFKRJK	B	RQP7T9	A
K6UYHX	B	NGR8RB	A	RU89ZD	A
K7LTHM	A	NT726P		RZBA28	A
KA76WJ	A	P9T2CF	A	T3ZZLC	A
KHEELX	A	P9XJAE	A	TEDXT2	A

TABLE 1

WebCode	Q1	WebCode	Q1	WebCode	Q1
TFJNTP	A	VZLBBY	A	ZLMX6P	A
TRGLHB	A	W2X6V7	A	ZTNCPR	A
TRYFJK	A	WBHJRG	B	ZVEDTU	B
TWWWXY	A	WD6HL6	A		
TYW63A	A	WMRDPR	A		
TZRN4B	A	WTGV33	A		
U3DU2D	A	WYLUET	A		
U8DY6B	A	X3L3H3	A		
U8PXPU	A	X7GUNE	A		
UAQZFV	A	XC8ADL	A		
UE89YN	A	XG4TG6	A		
UFH8VJ		XKHQM8	A		
UH6R2M	A	XLXVJJ	A		
UKWLZC	A	XV3ZBZ	A		
UW3YVH		XYJ3H7	A		
UW4N78	A	Y4NKU4	A		
UXHXE8	A	YBAFV8	A		
V6CPZ7	A	YG2NF2	A		
VD9KVJ	A	YGF8ZY	A		
VJX3CF	A	YKXA84	A		
VLJLGK	A	YTREZ6	A		
VME6JL	B	Z2FPM7	A		
VMY743	A	Z7U6FH	A		
VQXGY3	A	Z8682G	A		
VXVA8W	A	ZABRTN	A		

Response Summary - Q1

Total Participants: **197**

Based on the findings of your examination, to what degree can it be confirmed or refuted that the questioned document has been altered?

Response	Q1
A	173
B	19
C	0
D	0
E	0

Response Key:

A. The questioned document HAS BEEN ALTERED.
B. The questioned document HAS PROBABLY BEEN ALTERED.
C. CANNOT DETERMINE whether or not the questioned document has been altered.
D. The questioned document HAS PROBABLY NOT BEEN ALTERED.
E. The questioned document HAS NOT BEEN ALTERED.

**The sum of responses here may be less than the total number of participants responding due to omitted responses.*

Methods and Observations

What methods/techniques did you utilize? What observations were made from each method/technique?

TABLE 2

WebCode	Methods/Techniques	Observations
24JMWD	Visual Examination	4-11-2025 The red colored "Center Square University" text at the top of the page 4 appears as a darker color than the same printed text appearing on pages 1 - 3. The "seal" in the middle of the paper of page 4 is also a "darker" color than the same area on pages 1 - 3.
	Microscopic Examination	4-11-2025 Pages 1-3 appear consistent with same printing technology, ink jet - black text is pure black (no half tone colors) with some overspray, form background and color areas has halftone colors, original black non ball point ink for signatures. Page 4 is of a different printer - does not appear to be of toner but can't say for sure, does not have that melted appearance but it is shiny, black printed text consists of halftone colors and not pure black like text printed in pages 1 - 3, no overspray in lettering as it appears on pages 1 - 3, signature is not original and is not a pure black but contains halftones for color, form printed material is color halftones but contains black.
	Video Spectral Comparator (VSC)	4-11-2025 Magnification of printed material. Images taken and stored in a temporary file folder.
	Ultraviolet Light	4-11-2025 Pages were observed under UV lighting. Page 4 appears to have more optical brighteners than pages 1, 2 and 3. Control strip passed.
	Infrared Light	4-18-2025 Examined pages 1- 4 under infrared lighting on the VSC8000. Control strip passed. Differences were observed on page 4 - this page revealed dots that fluoresced whereas pages 1 -3 had what appeared to be small threads that fluoresced. Images taken. Images uploaded to temporary file folder.
	Indented Writing	4-18-2025 Pages 1 - 4 were examined on the ESDA2 for indented impressions. Test strip ran (made on 4-17-2025 but ran on 4-18-2025) and passed. No indentations of evidentiary value were observed. There is a noticeable difference on the electrographs between pages 1 - 3 and page 4. The printed material "image" that is on the electrographs of pages 1- 3 is barely if at all visible on these pages however, on page 4, the printed material is clearly visible. Electrographs were scanned and saved to a temporary file folder on 4-24-2025.
29VT8D	Macroscopic/Microscopic Examination	Observed the characteristics of the documents, including the background image, background wording, font, and signature on each page to determine if they were created using the same print process techniques, or if they shared any physical characteristics. The type/font on the questioned documents, Q01-01.1 - Q01-01.3 appear to have been created using inkjet printing technology and contain black ink original signatures that are not superimposable. The type/font on the questioned document, Q01-01.4, appears to have been created using toner printing technology and contains a non-original signature that is not superimposable to any of the signatures on the questioned documents, Q01-01.1 - Q01-01.3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Observed the characteristics of the documents, including the background image, background wording, font, and signature on each page to determine if they were created using the same print process techniques. Used magnification, ultraviolet (UV) lighting, transmitted lighting, and various filters* to determine if the documents were created in the same manner or originated from a common source. The questioned documents, Q01-01.1 - Q01-01.3, all appear to react similarly to the VSC filters and functions mentioned above and share similar physical characteristics. The questioned document, Q01-01.4, does not. *Includes 780nm and 925nm longpass visible flood lighting.
2CU3KZ	Visual Examination	As a result of the visual examination, the color of the watermark in the middle of the fourth page is slightly different from the other three pages.
	Ruler	When the fourth page is overlaid with the other three, the size of the outer frame from the fourth page is different from the other three pages.
	Magnification	As a result of closer examination using a magnifier, smudging of the printed letters was observed on the first three pages, but smudging was not observed on the fourth page.
	Video Spectral Comparator (VSC)	As a result of examination using a VSC, the watermark in the middle of the fourth page was observed, but the watermark in the middle of the other three pages was not observed under the infrared observation.
2GAEGG	Microscopic Examination	By visual microscopic examination Pages 1 – 3 have inkjet printing for background and text. Page 4 has a different printing technique. Pages 1 – 3 bear a signature written in black ball pen ink, the signature on Page 4 has been printed onto page.
	Transmitted Light	Viewing the papers in transmitted light – the paper for Pages 1 – 3 is different to that of Page 4.
	Video Spectral Comparator (VSC)	VSC – specialised light (UV, IT, Spot-Visible) Pages 1 -3 have a different response to specialised light examinations for both inks and the paper compared to Page 4.
	ESDA	The response of the inks on Pages 1 – 3 appeared different to the response of the inks on Page 4 on analysis of the ESDA lifts.
2QB29E	ESDA	no indentation found
	Microscopic Examination	printing techniques : page 4 differs from pages 1-3 : pages 1-3- details printed in black (inkjet). Page 4 is printed in color (inkjet). the signature: Pages 1-3 hand written in black liquid ink. Page 4. printed in color (inkjet).
	Video Spectral Comparator (VSC)	printing techniques : page 4 differs from pages 1-3 : pages 1-3- details printed in black (inkjet). Page 4 is printed in color (inkjet). the signature: Pages 1-3 hand written in black liquid ink. Page 4. printed in color (inkjet). Paper: Page 4 differs from pages 1-3 in: UV, transmitted light, filters and spot
	magnetic ink	non found
2Z3H2N	ESDA	Used for indented impressions detection; no printer paper pickup roller (mechanism) marks were detected.
	Handwriting Examination	On page 4, the signature was made with a color inkjet printer; the signature transcription slightly differs, and it is not a copy from the other three remaining document pages where the signatures were handwritten with a writing instrument.

TABLE 2

WebCode	Methods/Techniques	Observations
	Indented Writing	Used for indented impressions; no printer paper pickup roller (mechanism) marks were detected.
	Infrared Light	The luminescence of page 4 differs from the other three remaining document pages.
	Macroscopic Examination	Differences in paper structure and ink shade between page 4 and the other three remaining document pages.
	Magnification	Different ink distribution and physical paper structure – differences between page 4 and the other three remaining document pages.
	Microscopic Examination	Different ink distribution and physical paper structure – differences between page 4 and the other three remaining document pages.
	Micrometer	Differences: paper thickness of page 4 – ~0.102 mm, others – ~0.099 mm.
	Oblique Light	Paper structure, especially page 4; indented strokes of handwritten signatures on pages 1–3.
	Overlays	Differences in paper surface structure between page 4 and the other three remaining document pages. Also, indentation marks from handwritten signatures are absent on page 4.
	Ruler	The dimensions of all 4 document pages do not differ from each other.
	Thickness	Differences: paper thickness of page 4 – ~0.102 mm, others – ~0.099 mm.
	Transmitted Light	Under transmitted light, page 4 is darker, the paper fibers are denser, the page itself is thicker.
	Ultraviolet Light	All pages fluoresce blue, but page 4 fluoresces brighter than the other three remaining document pages.
	Video Spectral Comparator (VSC)	Used VSC-6000 H/S - all available light filters and modes, SPOT mode, where different surface luminescence of page 4 is clearly visible – it luminesces (glowing) much darker with white fiber inclusions compared to other pages.
	Visual Examination	The ink shade and structure of page 4 clearly differ.
	„General principles of document and handwriting examination“	SVP – 1/01 (General provisions (Common instructions) for the examination of documents and handwriting) – internal quality document, approved by our institution.
	„Examination of Document Requisites“	SVP – 1/02 (Examination of document blanks (forms) and requisites) – internal quality document, approved by our institution.
	„Examination of Technically Forged Signatures“	SVP – 1/05 (Examination of technically forged signatures) – internal quality document, approved by our institution.
	„Handwriting and Signature Examination“	SVP – 1/06 (Handwriting and signature examination) – accredited method, internal quality document, approved by our institution.
	„Examination of Indented Impressions“	SVP – 1/08 (Examination of indentation (imprints)) – internal quality document, approved by our institution.
	„Identification of Printing Techniques“	SVP – 1/09 (Identification (Evaluation) of printing method (techniques)) – internal quality document, approved by our institution.
	„Examination of Alterations to Original Document Requisites“	SVP – 1/10 (Examination of alterations (modifications) in primary document content) – internal quality document, approved by our institution.

TABLE 2

WebCode	Methods/Techniques	Observations
36A93A	Video Spectral Comparator (VSC)	Pages 1-3 display similar spectral reactions of paper UV fluorescence and fiber IR luminescence. Differences observed in spectral reactions of UV fluorescence of paper and fiber IR luminescence between page 4 and pages 1-3. Printing of pages 1-3 similar reactions with IR Absorption/Reflectance and IR Luminescence. Differences observed in IR Absorption/Reflectance and IR Luminescence reactions between Page 4 for outer border and background printing and pages 1-3.
	Macroscopic/Microscopic Examination	Signatures on pages 1-3 written with black pen ink. Page 4 signature printed on document. Coloured text and background printing in colour (CYMK) printing for all pages 1-4, black text on pages 1 to 3 in black printing and black text on page 4 in colour printing. Visual characteristics of printing similar on pages 1 to 3. Difference in visual characteristics and colour composition/intensity/hue observed between page 4 and pages 1-3. No printing defects were observed on pages 1-4.
	ESDA	ESDA of pages 1 to 4 displays dissimilarities between page 4 and pages 1-3, with page 4 printing visible on ESDA development foil and pages 1-3 printing not visible on ESDA development foils. No latent indentations observed on pages 1-4.
	Overlays	Common printing on pages 1-3 (header, border, personal information, page number, background) overlay with each other. Page 4 displayed overlay of some common printing (header, personal information and background) with pages 1-3 and differences in the size and/or position of the printed border, vertical lines and page number. Signature lines are in different positions on the pages. Line 'Awarded Bachelor of Science...' on page 4 displays differences in font/size/spacing to the rest of the document font.
37MZT6	Video Spectral Comparator (VSC)	Ink on page 4 reacted differently than ink on pages 1-3 with varied wavelengths and filters.
	Ruler	The horizontal alignment of the spacing at the start of sections of page 2 varied throughout the page.
	Microscopic Examination	The signature on page 4 was not original while the signatures on pages 1-3 were original.
3G4KEM	Macroscopic Examination	Printing process - inkjet. The margins on Q4 are not consistent with the margins on Q1,Q2 and Q3.
	Video Spectral Comparator (VSC)	The ink signatures on Q1, Q2 and Q3 reacted consistently, Q4 was not consistent. The paper used for Q4 document is not consistent with Q1, Q2 and Q3.
	Indentifont	Multiple fonts and font sizes are used throughout the documents, limited letters and numbers prevent a positive font identification. Header: 20pt Albertus Nova. Address: 10pt Calibri. Official Transcript: 14pt ITC Officina Sans. Student name block: 8pt Lucida Sans Typewriter. Q4 Student name and class content block: 8pt and 7pt Lucida Console. Class content: 7pt Lucida Sans Typewriter Bold.
3LEU6V	Visual Examination	The color of the university logo and the red title text “Center Square University” on 1-4 differs from those on 1-1 through 1-3.
	Side light	Embossing signatures observed on the reverse side of 1-1 through 1-3. No embossing signature on 1-4 reverse

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	The document prepared using inkjet printer. The signatures on 1-1 through 1-3 written by writing instrument, while the signature on 1-4 is printed. The black printing on 1-1 through 1-3 printed by using black inkjet ink, while the black printing on 1-4 printed by using color inks.
	Video Spectral Comparator (VSC)	Flood light with longpass filter 925 nm (IRR@925): The backgrounds, university's logos, and the signatures reflect the light and disappeared on 1-1 through 1-3, while they faded but still visible on 1-4. Infrared luminescence with longpass filter 645 nm (IRL@645): 1-1 through 1-3 reacts differently than 1-4. Spectrophotometer of the signatures measured. The results appeared that the spectra of the written signatures on 1-1 through 1-3 were different from the printed signature on 1-4.
	ESDA	Embossing from printing on front appeared on the reverse side of 1-1 through 1-3. No embossing appeared on the 1-4 reverse except the signature block. This suggests a difference in the printing or paper characteristics.
3NPH4A	Visual Examination	The paper color of page 4 is different from the paper color of pages 1, 2 and 3. The printing in the background (repetitive grey text), and the letterhead "Center Square University" have the different color.
	Microscopic Examination	The details of the printing fonts on page 4 are different than the on pages 1, 2 and 3. The signatures on the pages 1, 2 and 3 are in original form while the signature on the page 4 is in form of copy.
	Video Spectral Comparator (VSC)	The paper of page 4 shows a different behavior using Infrared Luminescence (IRL) and UV (365 and 254 nm) light illumination than pages 1, 2 and 3.
3Q9UJQ	Microscopic Examination	There are indications that a different printing system was used on page 4 than the rest of the document.
	Video Spectral Comparator (VSC)	At close up, there are indications that a different printing system was used on page 4 than the rest of the document. When using the infrared light source, it is observed that the inks have a different reaction on page 4 than the rest of the document.
	ESDA	No observations
3QAMGY	Video Spectral Comparator (VSC)	IT CAN BE SEEN THAT PAGES 1-3 HAVE THE SAME TYPE OF PRINTING, UNLIKE PAGE 4.
	Macroscopic/Microscopic Examination	IT CAN BE SEEN THAT PAGES 1-3 HAVE THE SAME TYPE OF PRINTING, UNLIKE PAGE 4.
	ESDA	
3WHTD6	Macroscopic Examination	Noted change in margin (horizontal) alignment of text on bottom portion of pg 2 and various vertical misalignments of text on pages 2 through 4. Noted on pg 2 there is a "Fall 2023" section, and also on page 3 is another "Fall 2023" section, though one is not a continuation of the other. Based on format, pg 2 I would expect "Fall 2022" where it reads "Fall 2023". This is in the same location as the left margin mis-alignment. Page 4 signature noted wording is "Authorized by", instead of "Verified by"

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	Pages 1 - 3: printing inkjet (ink absorbed into paper fibers, no extraneous particles), signature original handwriting (indentations in written line). Page 4: Printing inkjet, noted difference in printing compared to pg 1-3, color of repeated background and center circle appears slightly different color than pages 1-3. The black text is fortified by color ink droplets behind it, no noticeable ink bleed into fibers; (captured images). Signature on pg 4 is non-original, inkjet printed.
	Video Spectral Comparator (VSC)	Noted slight difference in UV response of paper between page 4 vs pages 1, 2 and 3.
	Oblique Light	Noted pg 3 has vertical linear indentation marks not observed on other pages. No indented writing of value observed.
	ESDA	No indented writing of value observed.
4NLAEM	Magnification	1. The background printing on pages 1, 2, and 3 correspond, while the background printing on page 4 appears different. 2. The printing of “Center Square University” on page 4 appears darker than the printing on pages 1, 2, and 3. 3. The appearance of the signature on pages 1, 2, and 3 correspond while the signature on page 4 appears different
	Infrared Light	1. During the IR analysis of “Item Q1” the signatures on the first three pages react in a similar way while the copied signature on page 4 reacts in a different way. 2. During the IR analysis of “Item Q1” it was observed that the borderline on pages 1, 2, and 3 reacts in a similar way while the borderline on page 4 reacts in a different way. 3. During the IR analysis of the paper of “Item Q1” it was observed that the IR reaction of pages 1, 2, and 3 correspond while the IR reaction of page 4 appears lighter.
	ESDA	1. No indentations were observed during the application of this method.
	Oblique Light	1. During the analysis with oblique light indentations were observed on “Item Q1”. The original signatures on pages 1, 2, and 3 are indented while the copied signature on page 4 is not indented.
4V6HXD	Video Spectral Comparator (VSC)	
	Stereoscopic Microscope	
6CK7MX	Video Spectral Comparator (VSC)	a. Under UV light illumination, the fluorescent response of page 4 is different from that of pages 1-3. b. Under specific wavelength illumination, the fluorescent response of the ink on page 4 is different from that on pages 1 to 3.
	Microscopic Examination	a. Pages 1-3 and page 4 were printed by different inkjet printers. b. the signature on page 4 was inkjet printed, the signatures on pages 1-3 were handwritten.
6KG4A2	Macroscopic/Microscopic Examination	The last page of the OFFICIAL TRANSCRIPT was created on a different printer than the one that printed the first three pages of the academic record.
	Microscopic Examination	The signature "Authorized By" on page 4 of the OFFICIAL TRANSCRIPT was printed digitally, while the first three pages of the questioned document were manually printed by a person using a ballpoint pen.
	Video Spectral Comparator (VSC)	UV, infrared and transmitted light techniques were used, which did not show any damage to the substrate of the pages that make up the questioned document.

TABLE 2

WebCode	Methods/Techniques	Observations
6LQDZD	Visual Examination	Visual examination revealed that the document was altered by page substitution of Q4 in the following manner: Color and quality differences between Q1-Q3 and Q4. The signatures on Q1-Q3 were consistent with each other (abbreviated form), the signature on Q4 contained a longer signature.
	Microscopic Examination	Microscopic examination revealed the presence of non-impact print process (inkjet), It also revealed that the document was altered by page substitution of Q4 in the following manner: The signatures on Q1-Q3 are original. The signature on Q4 is reproduced.
	Ultraviolet Light	Utilizing the ultraviolet lightbox revealed that the document was altered by page substitution of Q4 in the following manner: Q4 has brighter ultraviolet fluorescence than Q1-Q3.
	Oblique Light	No indented impressions found.
	Video Spectral Comparator (VSC)	Utilizing the VSC (Video Spectral Comparator), revealed that the document was altered by page substitution of Q4 in the following manner: difference in optical ink properties from Q1-Q3. The ink in the background and the signature on Q4 did not drop out, however, the ink in the background and the signatures on Q1-Q3 did drop out.
	ESDA	Lab item #1, Invoice #Q201201 was examined utilizing oblique/side lighting and EDD (Electrostatic Detection Device) for the possible presence of indented impressions. Indented impressions were not observed. Aside from the laboratory number, lab item number, envelope outline, paper outline, or extraneous markings, an impression of the overall document of Q4 was observed which was not observed on Q1-Q3.
	Digital Imaging	Digital imaging of original documents, VSC and EDD findings.
6M6DLM	Video Spectral Comparator (VSC)	The components of the paper on pages 1, 2, and 3 such as colour, thickness of the ink on the background printing and uneven edges on the printing differ from those of page 4.
	Microscopic Examination	The components of the paper on pages 1, 2, and 3 such as colour, thickness of the ink on the background printing and uneven edges on the printing differ from those of page 4.
	ESDA	No indentations were observed.
6RC4NT	Ruler	A ruler was used to measure the dimensions of the paper. It was determined that all three pages measure 8 ½ x 11 inches.
	Microscopic Examination	The Leica S8APO Microscope and Keyence VHX-7000 Digital Microscope were used to determine the printing processes used to create pages 1 through 4. Pages 1 through 3 are printed using inkjet with an inked pen signature, and page 4 is inkjet printed with an inkjet printed signature. The background text on page 4 is lighter than pages 1 through 3; there appears to be less cyan in the printing on page 4. The header “Center Square University” appears darker (black) in color on page 4. The signatures on pages 1 through 3 are inked pen, and the signature on page 4 is inkjet printed.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	The Video Spectral Comparator (VSC) 8000 was used to examine each page using various light sources. Flood Light – The center seal on page 4 differs in color from pages 1, 2, and 3; page 4 is more orange-colored as opposed to the pinker color seen on pages 1 through 3. Infrared (IR) 780 nm – The background printing, border, and center seal drop out of visibility under IR on pages 1, 2, and 3. The background printing (faint), border, and center seal remain visible under IR on page 4. Spot IR Luminescence – Page 4 appears to be more dense/ fibrous than the others. Oblique – No impressions were observed with side light. Transmitted – No watermark observed on pages 1, 2, 3, or 4. Ultraviolet (UV) 365 nm and 312 nm – Page 4 is optically brighter than pages 1, 2, and 3.
	Micrometer	A digital micrometer was used to measure the thickness of the paper. Eight measurements in mm were taken on each page and the average was calculated. The measurements were taken in areas free of printing. The average thicknesses were as follows: Page 1 – .10275 Page 2 – .107125 Page 3 – .104875 Page 4 – .10925
	ESDA	The Electrostatic Detection Apparatus (ESDA2) was used on each page (front and back) to determine whether impressions (e.g. indented writing) or any other evidence was present. No impressions were observed on pages 1 - 4. Pages 1, 2, and 3 – The background seal and header on pages 1 and 2 are blurred/illegible. The “Center Square University” header on page 3 has black letters (toner fills the body of the letters). Although the headers are not clear on pages 1 through 3, the body of the letters can be seen as black (toner fills the body). On the reverse sides of the documents, text is not visible. Page 4 – ESDA lift is darker with the background seal and header clearly visible/legible. The “Center Square University” header is reversed with the toner being on the outside of the letters (body of letters is lighter). On the reverse side of the document, the text is visible on the reverse. Pages 1 through 4 – Banding was observed on the reverse sides of each page. It could not be definitively determined if the same banding seen on pages 1 through 3 is or is not present on page 4.
	Handwriting Examination	Signatures are simplistic and indiscernible. Signatures appear freely and naturally prepared; signature on page 4 is non-original. Similarities in height relationships, letter formations, and pen movement. Dissimilarities in baseline relationship; signatures on pages 1, 2, and 3 are above the baseline and signature on page 4 falls below the baseline.
7B6AUY	ESDA	Embossing from original writing on the front of Item 001 pages 1, 2, and 3 was developed during EDD examination of the reverse side.
	Indented Writing	No decipherable impressions were developed on Item 001.
	Macroscopic Examination	Color differences between Item 001 pages 1 through 3 and Item 001 page 4 were observed. Specifically, the repeating "CENTER SQUARE UNIVERSITY" background printing is lighter in color on page 4, compared to pages 1 through 3 and the printed "CENTER SQUARE UNIVERSITY" colored circle in center of page 4 appears a different color (more orange), compared to pages 1 through 3.
	Microscopic Examination	Item 001 pages 1 through 4 were produced with inkjet technology. Differences in microscopic appearance of inkjet printing on Item 001 pages 1 through 3 and Item 001 page 4 were observed. Item 001 pages 1, 2, and 3 were signed with black ballpoint ink. Item 001 page 4 signature was produced with inkjet.

TABLE 2

WebCode	Methods/Techniques	Observations
	Ruler	Margin size difference between Item 001 pages 1 through 3 and Item 001 page 4 was observed. Item 001 pages 1 through 3 margins of document measured approximately 5/8" (top), 5/16" (left), 1/2" (bottom), 5/16" (right). Item 001 page 4 margins of document measured approximately 9/16" (top), 5/16" (left), 9/16" (bottom), 5/16" (right).
	Video Spectral Comparator (VSC)	VSC examination conducted on Item 001 pages 1 through 4 with the following results: Item 001 page 4 paper has different UV properties than Item 001 pages 1 through 3 paper. Item 001 page 4 has different margin (border) alignment than pages 1 through 3. (Also observed with measurements.) Item 001 page 4 CMY inkjet has different IRR properties than pages 1 through 3 CMY inkjet. Item 001 page 4 paper has different IRL properties than Item 001 pages 1 through 3 paper.
	Oblique Light	No decipherable impressions were observed on Item 001.
7B9QTX	Microscopic Examination	The signature handwritings on page1 /2/3 were written. The signature handwriting on page4 was printed by inkjet printer. The printed letters on page1/2/3 were made up by K ink. The printed letters on page4 was made up by CMYK ink.
	Infrared Light	Under 830nm infrared light, the watermark of page1/2/3 have disappeared. Under 830nm infrared light, the watermark of page4 can still be seen.
	Ultraviolet Light	Under 365nm ultraviolet light, the watermark of page1/2/3 have not fluorescence. Under 365nm ultraviolet light, the watermark of page4 has fluorescence.
7BND3Y		**No Methods or Observations were reported by this participant.**
7RAVVZ	Visual Examination	First, a direct observation (visual examination) was used to analyze the academic record, consisting of four pages, identified by footnotes 1 to 4. This analysis revealed that page 4 exhibits a color difference throughout its content. This means that the color of the watermark (texts), the preprinted text, and the university logo differ from that seen on the remaining pages.
	Magnification	Subsequently, a macroscopic and microscopic analysis was carried out on the folios in question, using a 10x optical instrument, where it was observed that on page four they present a total alteration due to the fact that the tonality it presents is due to the printing system different from the rest of the folios.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	The analysis continued with the implementation of wide-field-of-view equipment, specifically a document comparator. This instrument allowed the examined documents to be thoroughly exposed to various controlled light sources. The primary objective of this stage was to detect the possible presence of alterations or modifications in the substrate of the documents when exposed to ultraviolet light with a wavelength of 365 nm. Upon inspection under this light, the absence of significant changes in the composition of the substrate of the analyzed documents was evident. In a subsequent stage of the analysis, macroscopic observation was performed under visible light conditions. This examination revealed a notable disparity in the chromatic hue of various elements on the folio identified as page 4. Specifically, a difference was observed in the hue of the printed text, the watermark incorporated into the paper, and the center square university distinctive logo on that folio. Similarly, it was found that the signature on page 4 had characteristics of a digital reproduction, characteristics that substantially differentiate it from the characteristics of the handwritten signatures found on the preceding pages, specifically on pages 1, 2 and 3.
8G7ZEF	Visual Examination	A discrepancy in the quality of the tonal color of pages 1, 2, and 3 is observed compared to page 4.
	Macroscopic/Microscopic Examination	It is confirmed that pages 1, 2, and 3 show characteristics of the printing, tonality, font type, and simplified signature, which are inconsistent with page 4.
	Video Spectral Comparator (VSC)	By applying infrared light, a discordant reaction can be seen between pages 1, 2 and 3 with respect to page 4, observing fading of both the water background and the signatures.
8WL4W6	Visual Examination	The colour of the paper and the background printing of page 4 were different from those of pages 1 to 3.
	Microscopic Examination	The signature on page 4 was inkjet printed while the signature on each page of pages 1 to 3 were handwritten signatures. The background printing of all the four pages were inkjet printing.
	Video Spectral Comparator (VSC)	The optical property (under ultraviolet fluorescent light) of the paper of page 4 was different from those of pages 1 to 3. The optical properties (under ultraviolet fluorescent light and/or spot light) of the background printing and overprinting of page 4 were different from those of pages 1 to 3.
96AG9A	Overall paper examination	Analysis of paper characteristics. In a first look at the characteristics of the paper used to prepare the academic transcript, we note that pages P1, P2, and P3 have dimensions of 280x217 mm, while P4 has dimensions of 279x216 mm, and are therefore different. Regarding the finishing, all the cut edges show some irregularity, but they are much rougher on page P4. Under transmitted light, none of the papers include a watermark indicating their origin source or trademark. Exposed to UV illumination (365 nm) to test the response of the bleaching agents present in the paper stock, page P4 offers a more intense bluish white tone than the other pages P1, P2, and P3. Using such illumination, on the other hand, we discovered that pages P1, P2 and P3 contain singularities in their mass, in the form of longitudinal wounds, which are not present in the formation of P4.

TABLE 2

WebCode	Methods/Techniques	Observations
	Macroscopic/Microscopic Examination	Analysis of the printed texts and images. All of the printed texts and images on the four pages of paper that make up the academic transcript, with the exception of the signature, which is handwritten on pages P1, P2, and P3, were generated with a color inkjet printer (CMYK). However, as a result of the findings detailed below, the printer that printed pages P1, P2, and P3 was not the same as the one that printed page P4. a) Optical examination to determine the use of pigment or dye in the printer ink used to generate the document's texts and images: Microscopic and infrared examination of the printouts revealed the presence of ink of a homogeneous composition on pages P1, P2, and P3, and a different one on page P4. Specifically, the use of dye ink is evident in the images (including the outer rectangular frame) printed on pages P1, P2, and P3, while the outer frame of page P4 shows the use of pigment ink. The pigment not only has a tarry appearance under a microscope, but, in the case of the black color, it is not transparent to infrared radiation. Likewise, the use of only pigment black for printing the text on pages P1, P2, and P3 is noticeable, unlike page P4, where the text also adds cyan, magenta, and yellow to the black. The images below show the differences described above, along with their appearance under both a macroscope and 780nm IR radiation.
	Infrared Light	b) Infrared Examination of the Document: Although this illumination technique previously confirmed the presence of a different ink composition between pages P1, P2, and P3 compared to P4, a general examination also reveals a very important discrepancy: the presence of a handwritten signature on pages P1, P2, and P3, which appears transparent under IR 780nm, unlike the signature on page P4, which, having been printed using an inkjet printer with some black pigment content, is not transparent. Under the macroscope, it can be seen that some are originals and the last is a reproduction from the same inkjet printer that generated the entire page P4.
	Microscopic Examination	c) Printhead resolution: Microscopic examination of a printhead's resolution is no easy task. By analyzing the vertical lines of the black text, we noticed that the resolutions were different: lower on the printer used for pages P1, P2, and P3 (approximately 250 ppi) and higher on the one used to print page P4 (approximately 360 ppi).
	Microscopic Examination	d) Ink droplet size: Looking at lighter colored areas, where the yellow droplets can be more easily isolated, it can be seen that the printer used to print page P4 is significantly larger than the printer used to generate pages P1, P2, and P3.
	Microscopic Examination	e) Typography of letters, numbers, and symbols in the text: When comparing two texts printed with inkjet devices, the construction of a specific letter, number, or symbol is relevant and discriminatory, even if both have an identical format. The following images show that this parameter also allows us to differentiate pages P1, P2, and P3 from page P4.
	Microscopic Examination	f) Number of colors used: In color mixtures, the colors used to make the mixtures are discriminatory. In this case, it is very evident that the mixture to obtain the color red, in its proportions or quantities, is different on pages P1 to P3 compared to page P4.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	g) Digital pattern or printer fingerprint: The pattern of printed dots on a document generated with an inkjet printer depends on the operating system, software, drivers, print settings, and the printer head itself. Contrary to what one might think when looking at a stochastic FM pattern for any inkjet print, it is the printer's algorithms that actually decide where to position the ink droplets in a specific manner. In the case of multi-copy print jobs, this pattern will be reproducible because identical printing conditions are respected and can be used to discriminate between documents that were presumably printed in the same printing order. Scanning with 780nm IR radiation, we discovered a pattern of pigment dots in the upper left corner that is repeated on pages P1, P2, and P3 and does not appear on P4 because it does not belong to the same printing order or the same printer. In addition, we include a detailed area where some constellation of points appears respecting the same pattern that allows P1, P2 and P3 to be brought together in front of P4.
99VYTF	Visual Examination	There is a discrepancy in the quality of the tonality of pages 1, 2 and 3 with respect to page 4.
	Macroscopic/Microscopic Examination	Pages 1, 2, and 3 are confirmed in comparison to page 4. Printing characteristics, tonalities, font type, and simplified signatures are noted, with a discrepancy in the documentation.
	Video Spectral Comparator (VSC)	Using infrared light, a discordant reaction can be seen between pages 1, 2, and 3 compared to page 4, with fading of both the watermark and the signatures.
9JEDWH	Visual Examination	The document is formed from four separate sheets of white paper bearing printed text and signatures. The printed text on pages 1 - 3 appears to have soaked through the paper more than page 4.
	Macroscopic/Microscopic Examination	Pages 1 - 3 have been produced using colour inkjet print; page 4 appears to have been produced using a different printing method and/or resolution. The signatures on pages 1 - 3 are in original form and have been applied using black fluid; the signature on page 4 is not original and has been printed. The authorship of the signatures has not been considered.
	Ruler	Pages 1, 2 and 3 are a slightly different size to page 4.
	ESDA	No obvious impressions were found.
	Video Spectral Comparator (VSC)	Page 4 differs from pages 1 - 3 in terms of its appearance under ultraviolet light and the surface texture also differs when viewed using oblique light. A small number of fluorescent fibres are visible within pages 1 - 3; many more fibres appear to be present within page 4.
9LGFJX	-Visual examination -Macroscopic /microscopic examination -Magnification	- The signature on page 4 of the questioned document (Q1) was produced by a printer/copier, whereas the signatures on pages 1, 2 and 3 of the questioned document (Q1) were written manually using a pen. - The printer/copier used to produce page 4 of the questioned document (Q1) is different from the printer/copier used to produce pages 1, 2 and 3 of the questioned document (Q1).
	ALS examination (UV/IR/IRL lights examination)	- The reaction of the paper of page 4 of the questioned document (Q1) under UV and IRL lights is different from that of the paper on pages 1, 2 and 3 of the questioned document (Q1). - The reaction of the background print of page 4 of the questioned document (Q1) under IR light is different from that of the background print of pages 1, 2 and 3 of the questioned document (Q1).

TABLE 2

WebCode	Methods/Techniques	Observations
	Indented writing (ESDA and Oblique Light)	No indented writing observed.
9MPMMQ	ESDA	No developed indentations observed. Paper handling marks observed on pages 1-3 found to be consistent, while page 4 was not.
	Macroscopic/Microscopic Examination	Obvious visual differences in color between page 4 and pages 1-3. Under magnification the printing quality differed between page 4 and those of pages 1-3. Signatures on pages 1-3 were observed to be original pen ink, while the page 4 signature was machine printed. Dated entry on page 2 of "Fall 2023" is chronologically incorrect. Date is repeated correctly on page 3.
	Overlays	Digital alignments and overlays found minor inconsistencies throughout all pages of the document with respect to spacing, margins, and arrangement.
	Video Spectral Comparator (VSC)	Different substrate response observed (IR and UV) on page 4 relative to pages 1-3. Strong UV response produced by paper inclusions observed on reverse side of pages 1-3, while page 4 had no observable inclusions by comparison. Under IR examinations the printed entries on page 4 produce different responses compared to those on pages 1-3, when compared.
9R42RK	Magnification	A similar printing process was used when a background printing for page 01 to page 03 was produced, whereas page 04 background printing was produced using a different printing process.
	Infrared Light	The signatures from page 01 to page 03 appear in the same way under infrared light, whereas the signature on page 04 appears differently when viewed under infrared light.
	Ultraviolet Light	Page 01 to page 03 appear to be UV dull when they are viewed under UV light, whereas page 04 is UV bright when viewed under UV light.
	Visual Examination	A similar font and wording was used for page 01 to page 03 i.e “Verified by”, whereas for page 04 a different font and wording was used i.e “Authorized by”.
9R8QUW	Video Spectral Comparator (VSC)	I used for examination of evidences Q1
	Microscopic Examination	I used for paper- printed techniques in Q1
	Microscopic Examination	Same used for techniques in printed Q1, and signatures
9Y4MGY	Visual Examination	The Forensic Documentology Laboratory has the policy of documenting the questioned and subsequent document through the photographic camera. Critical equipment was used in the following order (Microscope Regula 5001 MK and Video Comparator Spectrum 6000 HS).
	Oblique Light	It was observed that the signatures visible on the first three pages show grooves, while the signature visible on the fourth page shows no groove and the paper absorbs the ink.
	Transmitted Light	This light source was applied to determine if the four signatures matched each other and to verify if we are dealing with a case of reproduction by mechanical means.
	Ultraviolet Light	When exposing the four sheets at wavelength 365nm, it is observed that the first three pages show different tonality and opacity than the reaction of the last page (fourth sheet).
	Infrared Light	When using the 715nm infrared it is observed that the enumeration of pages 1,2 and 3 react in reflectance, however, page 4 reacts in absorbance.

TABLE 2

WebCode	Methods/Techniques	Observations
	Magnification	When exposed under direct light and magnification, it is observed that the four (04) pages show color pigmentation typical of the inkjet printing system; however, pages one (1), two (2) and three (3) show greater sharpness, while page four (4) is opaque.
	Macroscopic/Microscopic Examination	Although it is a case of alterations, we verified the entire document, that is to say, observations were made on the first three pages that have signatures that are in original, however the fourth page the signature is not original due to the fact that it was made by mechanical means.
	Video Spectral Comparator (VSC)	Infrared filters, magnification and ultraviolet light were used to observe that pages 1, 2 and 3 do not share a common source in relation to page 4.
AN4CLW	Video Spectral Comparator (VSC)	For viewing and verifying printing systems
	Magnification	See document overview
BGDGYJ	Método para alteración de documentos	El método manifestado se contempla en la guía patrón para el examen de documentos (guía patrón para el examen de documentos falsos de ASTM INTERNATIONAL), tomando en consideración referencias bibliográficas y buenas prácticas. [Requested translation was not provided by the time of publication.]
	Visual Examination	En esta etapa de análisis preliminar observamos que el documento no presenta interferencias por el cual se continuó con el análisis. Se continua con la etapa dos sin instrumentos en el cual observamos variación de color de tintas, tipografía y formato en la hoja identificada como número 4. [Requested translation was not provided by the time of publication.]
	Macroscopic/Microscopic Examination	En la etapa con los instrumentos ópticos observamos y de igual manera confirmamos la variación de color de las tintas, la tipografía y el formato en la hoja identificada como número 4. [Requested translation was not provided by the time of publication.]
	Video Spectral Comparator (VSC)	Luz visible: se confirman lo señalado en las etapas anteriores. Con la diversas fuentes de luz ultravioleta: se observa variación en las tonalidades de las hojas identificadas como número 1, 2 y 3 en comparación a la hoja número 4. Con las diversas fuentes de luz infrarroja: desaparece el logo del fondo de documento en la hojas número 1, 2 y 3 mientras que en las hoja número 4 se mantiene. [Requested translation was not provided by the time of publication.]
BHUFE3	ESDA	
	Video Spectral Comparator (VSC)	UV, Infrared, Oblique lighting
	Microscopic Examination	Printing process/signatures observed.
BJ6H22	Macroscopic/Microscopic Examination	Use stereomicroscope to determine printing method and features. Paper surface and texture. Whether the signatures are original or non-original.
	ESDA	Scan each page for indentations of handwriting and roller marks from printer. Reaction of paper and print to ESDA process.
	Video Spectral Comparator (VSC)	UVL for optical brighteners, IRR/IRL of inks and paper. Oblique light scan. Transmitted light for paper morphology.
BQYMU3	Oblique Light	No significant findings observed.
	ESDA	Indentations/embossments were developed on the back sides of pages 1, 2, and 3 of the transcript.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Using an infrared flood light, the signatures and page numbers on pages 1, 2, and 3 dropped out completely. The background dropped out in all 4 pages; however, the background on page 4 lightened but did not completely drop out. Similar observations were observed with all 12 camera filters; however, only images using the 1000nm filter were captured. Using a spot color light, paper fibers were fluorescing on all 4 pages, but there were more fibers fluorescing on page 4. Similar observations were observed with all 9 spot light colors (slight variations between camera filters), but only images using the green light were captured. Additionally, the inks for the initials were fluorescing on pages 1, 2, and 3. Ink for the signature on page 4 did not fluoresce under any spot light color.
BVVCDU	Visual Examination	• No shade changes are observed in the support material. • There are no shade changes on the printing areas. • There is no overlap in the printed text. • No additions are observed in the printed text. On page 4 regarding pages 1, 2 and 3: • There are shade changes in the support material. • There are shade changes with respect to the printed areas. • There is no overlap in the printed text. • No additions are observed in the printed text.
	Microscopic Examination	A detailed study was carried out with the help of a microscope and specialized spectral analysis equipment (spectral video comparator), using different light sources, in order to locate the possible existence of signs of alteration: the following results were obtained: With optical magnification equipment: • No overlapping or addition of strokes or elements are observed in the four pages. • The printed background and coat of arms are observed with dot printing on pages 1, 2 and 3. • The signature is original on pages 1, 2 and 3. • The printed background and coat of arms are poorly defined on page 4. • The signature is printed on page 4.
	Video Spectral Comparator (VSC)	The document was also subjected to different light sources and spectral analysis with the following results: On page 1, 2 and 3: • When applying incident light: no detachment of paper fibers was observed in any specific area. • With transmitted light: no wear or thinning of the paper fibers was observed in any specific area. • No discrepancy was observed in the box, letterhead, vertical line or page number. • When subjected to raking light: no lifting or detachment of the fibers was observed. • As for ultraviolet light, the support is bright, with no changes in tonality in the sections, nor stains suggesting ink washing. Regarding the infrared spectrum analysis, the following was observed: • Absorption in the inks of the printed background and the coat of arms. • A light shade is observed in the frame. • A light shade is observed in the signature. The following characteristics are observed on page four: • When applying incident light: no detachment of paper fibers was observed in any specific area. • With transmitted light: no wear or thinning of the paper fibers was observed in any specific area. • There is a discrepancy in the box, letterhead, vertical line and page number, with respect to pages 1, 2 and 3. • When subjected to raking light: no lifting or detachment of the fibers was observed. • As for ultraviolet light, the support is bright, with no changes in tonality in the sections, nor stains suggesting ink washing. Regarding the analysis related to the infrared spectrum, the following was observed: • Absorption in the inks of the printed background and the coat of arms. • A dark shade is observed in the frame. • A dark shade is observed in the signature.

TABLE 2

WebCode	Methods/Techniques	Observations
BVW49G	Visual Examination	The analysis of document Q1 begins, discarding interferences for its study. Next, a different type of printing is observed between pages 1, 2, and 3 compared to page 4. It is also noted that the signatures on pages 1, 2, and 3 are handwritten, while on page 4, they are printed. Optical instruments were used for this.
	Video Spectral Comparator (VSC)	Upon entering the questioned document (Q1) into the spectral equipment, white light was applied with magnification in different areas of the document, which allowed for the difference in quality and type of printing to be evidenced. When using fluorescence and an IR filter, a different reaction is observed in the signatures located on pages 1, 2, and 3 compared to page 4. Likewise, grooves were only observed in the signatures of pages 1, 2, and 3.
	ESDA	When submitting the questioned document (Q1) to the electrostatic detection apparatus, a development was obtained without the presence of text, signatures, numbers, or indented figures.
BWDZYV	Video Spectral Comparator (VSC)	Equipment that allows, through the different illuminations and wavelengths, to observe alterations, chromatic tones of the substrate and differential physical behaviors of the inks used in the filling out of the document in question: it also allows images of what was observed to be obtained
	Microscopic Examination	Nikon SMZ1500 stereo microscope with digital camera. It allows the detailed observation of the physical characteristics of the document, for the present case the identifying aspects that indicate whether or not an alteration was presented
	Magnification	Portable magnifiers. Allows to evidence details of the documents
C2EYK6	ESDA	Differences in lifted impressions from page 4 compared to that from page 1 to page 3.
	Macroscopic/Microscopic Examination	No exclusionary differences in typeface, design (background logo and repeated printed texts 'CENTER SQUARE UNIVERSITY'). Exclusionary differences in printing quality and characteristics of page 4 compared to that of page 1 to page 3. Signature on page 4 produced by printing whereas signature on each of page 1 to page 3 was made using wet pen ink.
	Visual Examination	Differences in colour of printed background logo on page 4 compared to that of page 1 to page 3. Inconsistency noted in duplicated printed text on page 1, misalignment of printed text in page 2, duplicated printed text "Fall 2023" on page 2 and page 3, error grade point in page 2, additional line spacing in page 4.
	Ruler	Differences in length of page 4 compared to that of page 1 to page 3. but not considered as exclusionary differences.
	Transmitted Light	No watermark, paper thinning or thickening observed.
	Video Spectral Comparator (VSC)	Exclusionary differences in optical properties of paper (page 4) compared to those of page 1 to page 3. Presence of individual yellow stray dots near bottom of page 1 to page 3, but absence of such dots in bottom of page 4.
CA92QM	Video Spectral Comparator (VSC)	The VSC was used to visualize the documents using alternate light sources, UV, IR, IRL, and transparent light. Page 4 reacted differently compared to pages 1-3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Macroscopic/Microscopic Examination	With a digital microscope, captured images of the method production and writing ink vs. printed ink. The original writing was black ink on pages 1-3. Page 4, the writing was created with inkjet printing.
	Indented Writing	The ESDA was used to develop indented writing impressions. No impressions were observed.
CGUXUC	Microscopic Examination	• Roller impressions on the front and back side of Page 3 • There are no roller impressions on Pages 1, 2, and 4 • Pages 1 through 3 – "CENTER SQUARE UNIVERSITY" background text print and circular image in the center of each page, are dark in contrast to white paper (consists of 3 color toner (Magenta, Yellow with very little Cyan). • Page 4 – "CENTER SQUARE UNIVERSITY" background text print and circular image in the center of each page, are light in contrast to white paper and consists of 3 color inkjet (mostly Magenta, Yellow with very little Cyan) and a Black Ink overlay • Pages 1 through 3 – The black line framing the document, consists of 3 color Cyan, Yellow, and Magenta (with some Black dots) • Page 4 – The black line framing the document, consists of 3 color inkjet Cyan, Yellow, and Magenta with a Black overlay • Pages 1 through 3 – Header Information text is printed in solid Black Ink. • Page 4 – Information text is printed in 3 colors: Cyan, Yellow, and Magenta with Black overlay
	Oblique Light	• Roller impressions on the front and back side of Page 3 • There are no roller impressions on Pages 1, 2, and 4 • Pages 1 through 3 – backsides of documents have embossing behind the signatures • Page 4 – backside of document DOES NOT have embossing behind the signature
	Video Spectral Comparator (VSC)	• Pages 1 through 3 vs Page 4 revealed the following differences when examined with UV / IR / Spot light sources with various filter combinations: o the "black" outside boarder o background text and emblem in the center emblem o printing processes • Pages 1 through 3 vs Page 4 revealed the following differences when examined with UV / IR / Spotlight sources with various filter combinations: o Black blotching strips running vertically (1-3 yes) (4 no)
	Visual	• Pages 1 through 3 – Header Information text is printed in solid Black Ink. • Page 4 – Information text is printed in 3 colors: Cyan, Yellow, and Magenta with Black overlay • Pages 1 through 3 – Consists of three pages of paper of similar weight. Can easily see light through the paper • Page 4 – Consists of one piece of paper of heavier weight. Cannot easily see light through the paper • Pages 1 through 3 – All three-signature line begins with "Verified by" • Page 4 – Signature line begins with "Authorized by" • Pages 1 through 3 – Single space between Forensic Science and Class Name headers • Page 4 – Double space between Forensic Science and Class Name headers
CH38KN	Microscopic Examination	It allowed us to determine the differences in the printing system and the differences in the edges of the pages. The printing system used on pages 1, 2, 3, and 4 is inkjet; however, on page 4, in the print where it reads 'Center', the edges are more defined and have more saturation of the black color, while on pages 1, 2, and 3 the edges are more irregular and more black dots are visible.
	Video Spectral Comparator (VSC)	Spectral analysis using ultraviolet light, spot fluorescence, infrared, and grazing light. This is useful for determining possible differences in ink hue and the optical behavior of paper under UV rays due to different loadings of sizing agents, optical brighteners, lime, etc. Differences in the tone of pages 1-3 are detected compared to page 4

TABLE 2

WebCode	Methods/Techniques	Observations
	ESDA	Indented writing is not detected.
	fluorescence	The brightness of the paper used on page 4 is different from pages 1 to 3. Some brighter fibers are observed.
CKFGZF	ESDA	No indentations were observed on the document marked Q1
	Video Spectral Comparator (VSC)	The document marked Q1.D appears different from documents marked Q1.A to Q1.C The inkjet printing on document marked Q1.D differs from the inkjet printing on documents marked Q1.A to Q1.C The ink react differently under Infrared light when document marked Q1.D is compared with documents marked Q1.A to Q1.C Similarities in inkjet printing were observed on documents marked Q1.A to Q1.C Signature ink on documents marked Q1.A to Q1.C react the same under Infrared light
CMKARU	Visual Examination	• Pre-printed letter-size form filled out electronically • Larger dimensions of the page are observed in the first three pages in relation to the fourth page. • There is a difference in tonality in the printing of the central image of the document, on page 4, in relation to the first three pages. • There is less printing shade in the legend "CENTER SQUARE UNIVERSITY" on the fourth page.
	Microscopic Examination	• The four pages were printed in an inkjet system (Inkjet). • The fourth page shows dot saturation in its printing. • The typographic elements of the fourth page present the following differences in relation to the first three pages: - Greater thickness. - Yellow halo on the edges.
	Video Spectral Comparator (VSC)	• The signatures of the first three pages present the following characteristics: - Ridges in the strokes are a product of the muscular pressure exerted by the amanuensis on the paper with the inscribing tool. (Raking Light). - Brightness in the strokes, i.e., traces of oily ink elements. (Oblique Light). - The start and end of the strokes are clearly defined. - No distortion in the design of the characters due to the flexible nature of a printing matrix. - Fine strokes. • The signature of the fourth page presents the following characteristics: - Absence of ridges in the strokes. (Raking Light). The edges of the strokes are irregular, due to the absorption of the ink on the paper. (Oblique light). - There is opacity in the strokes, product of the characteristic elements of the liquid inks of digital printing (Oblique Light). - The start and end of the strokes are overlapped, - There are satellites on the edges of the strokes. • Transmitted light: No thinning of the paper was observed on any specific area • Infrared light: Fading of the ink in the signatures was observed. Except for the signature on page 4. In addition, the paper on page 4 shows a reaction of some of its fibers. • Ultraviolet light: No stains of any chemical element are observed in the support.
CRDA7P	ESDA	No indentations are observed in the document identified Q1, (4 sheets)
	Microscopic Examination	Under microscopic observation, two types of printing are observed on the document identified Q1. Pages 1-3 are different compared to page 4-4
	Visual Examination	The signature area on pages 1-3 shows a name, however, on page 4-4 both first and last name are shown. At the bottom of pages 1-3 it contains the word Verified by: printed on it and on page 4-4 the word Authorized By:.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Optical analysis shows on page 4-4 a change in the composition of its fibers and color of the paper different from that presented on pages 1-3 of the document identified Q1. Optical analysis shows a change in ink concentration on pages 4-4, which is not present on pages 1-3.
D2VB2P	Macroscopic/Microscopic Examination	Page 4 is a machine produced color copy. Printing process used to prepare page 4 is different from pages 1-3. Signature on page 4 is a non original. Signatures appearing in pages 1-3 are original wet ink signatures.
	Oblique Light	Embossing found on the reverse sides of signature areas on pages 1-3. None found on page 4.
	Infrared Light	Verified that signature on page 4 is toner based signature and signatures on pages 1-3 were written with black ink.
D6UNNE	Video Spectral Comparator (VSC)	Inkjet printed on page 4 is different to inkjet printed on page 1 to 3.
	Transmitted Light	Border line of academic transcript on page 1 to 3 do not match with the border line on page 4.
	Ultraviolet Light	Page 4 react differently compared to page 1 to 3.
	ESDA	No indentations found on the document
	Oblique Light	There are reverse impressions of signatures on page 1 to 3 while no reverse impression of signature on page 4.
DBZHGP	Macroscopic/Microscopic Examination	Differences noted in printing color, print quality, sequence of years not correct from page 2 to page 3, and differences in printing processes.
	Oblique Light	Vertical lines observed on reverse of page 3, no other indentations observed on pages 1, 2, or 4, No watermarks observed. Safety paper showed different print quality on page 4 than pages 1 thru 3.
	Ruler	Differences noted in margins and spacing of certain areas of the document
	Transmitted Light	Check for any other watermarks
	Infrared Light	No significant differences noted with infrared with printing, paper, etc.
DHHTR6	Video Spectral Comparator (VSC) – UV, NIR	The paper of page 1, 2 and 3 is the same (e.g. colour, optical properties); the paper of page 4 is different than the paper of page 1, 2 and 3 (e.g. colour, optical properties).
	Ultraviolet Light	The papers of page 1, 2 and 3 have characteristic marks, such as streaks and stains, visible only under UV light on the reverse, unprinted side - page 4 does not have such marks.
	Video Spectral Comparator (VSC) – oblique light, ESDA	Characteristic indented impressions in the form of vertical lines were revealed – very clearly visible on cards 1 and 3. Poorly visible on card 2. No analogous lines on card 4.
	Video Spectral Comparator (VSC) – VIS, transmitted light	The margins, topography and structure of the same graphic elements are the same on every page.
	Macroscopic/Microscopic Examination	The size and font type of similar texts is the same on every page.
	Video Spectral Comparator (VSC) – VIS, oblique light, UV-NIR	The signatures on cards 1, 2 and 3 in the "Verified by:" positions are handwritten and have the same optical properties. The signature(s) in the "Authorized by:" position on card 4 is (are) ink-jet printed.

TABLE 2

WebCode	Methods/Techniques	Observations
	Macroscopic/Microscopic Examination	The overprints on cards 1, 2 and 3 were made with use an ink-jet printer – the prints on these cards have the same optical properties, quality and morphology – the same defects were revealed, probably caused by a faulty black ink printhead. On cards 1, 2 and 3, all overprints were made using coloured inks, except for the black texts, which were made only with black ink. The overprints on card 4 were made using a different printer than pages 1, 2 and 3. Compared to the overprints on cards 1, 2 and 3, they do not have characteristic defects, they have different optical properties, different quality and morphology. In addition, all overprints, including the black texts, are coloured prints.
DPKZBE	Video Spectral Comparator (VSC)	Page 4 reacts differently to pages 1-3, when exposed to UV light.
	Magnification	The printing quality on page 4 differs to that of pages 1-3.
	Magnification	The signature on page 4 is printed.
DY9QVK	Macroscopic/Microscopic Examination	Halftone and dot per inch of page 4 does not match with those of other pages.
	Visual Examination	Margins of the box in page 4 is not overlay with those of page 1, 2, and 3.
E2ED9P	Visual Examination	Pages 1, 2 and 3 have similar paper sizes but page 4 has a slightly smaller height. All texts on all four pages have similar font and font size. The Header Center Square University on page 4 has a black red colour compared to those on pages 1, 2 and 3 having mainly red colour. The background logo on page 4 has a less bright red colour compared to those on pages 1, 2 and 3. The background text on page 4 was visually faded compared to those on pages 1, 2 and 3. There were repetitive texts titled Current Program and subtitle College and Major on page 1 with unusual text margins. There was also an awkward placement of texts of E Hrs on the right side of page 1, which did not have the same format as others. The red colour of the header could be observed more from the reverse of pages 1, 2 and 3 compared to page 4.
	Transmitted Light	No watermark was observed on all four pages.
	Ultraviolet Light	All four pages have no reaction under different wavelengths of Ultraviolet light. However, the texts and background logo on page 4 were observed to be darker than those on pages 1, 2 and 3.
	Oblique Light	No indentation was observed on the front side of all four pages. There were indentations of the signatures observed on the reverse of pages 1, 2 and 3.
	Video Spectral Comparator (VSC)	The signatures on pages 1, 2 and 3 have similar reactions where inks disappear at 400 to 535 nm range spot light with 715 nm filter. The signature on page 4 has no reaction under different light settings and filters.
	Overlays	The border frame, header and background logo on pages 1, 2 and 3 were aligned when the paper edges were superimposed with each other. The left margin of page 1 was similar to that of page 2, but different to that of pages 3 and 4. The left margin of page 3 was similar to that of page 4, but different to that of pages 1 and 2. Overlays of page 4 with all pages 1, 2 and 3 revealed that the paper edges, border frame, header and background logo did not align. Some of the word margins on all four pages were similar, some were not. The paragraph spacing on all four pages was similar.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	The header on page 4 has more apparent black dots compared to those on pages 1, 2 and 3. The background texts on all four pages were made up of multicolour dots where page 4 has brighter yellow dots and pages 1, 2 and 3 have brighter blue dots. The black texts on pages 1, 2 and 3 were dark and consisted of a uniform black colour. The black texts on page 4 were faded and consisted of multicolour dots. Pages 1, 2 and 3 have similar printing characteristics but different to that of page 4. The signatures on pages 1, 2 and 3 were made up of a uniform black colour while the signature on page 4 consisted of multicolour dots.
	ESDA	There was no indentation observed on the front side of all four pages. There were indentations observed on the reverse of pages 1, 2 and 3 which all corresponded to the signatures on the front side of the pages respectively.
ELXF7A	Microscopic Examination	Microscope and palm print loop. Examination of fonts, handwritten signature, ink.
	Video Spectral Comparator (VSC)	Examination ink jet inks, oblique light for gripper/picker bars, indentations, printing processes, paper, inks.
	ESDA	Indented writing or indentations.
	Font	Examine fonts, utilized Identifont.
	Micrometer	Measure paper.
	Ruler	Measure paper and font sizes.
EQQKWT	Macroscopic Examination	Observations made during macroscopic examination included variation between the inkjet printing (quality, color) of pages 1-3 and page 4, text misalignment (horizontal and vertical) throughout the document, and a contextual error on page 2 ("Fall 2023" should be "Fall 2022").
	Microscopic Examination	Observations made during microscopic examination included original signatures on page 1-3, a non-original/inkjet signature on page 4, black inkjet ink on pages 1-3, and fortified black inkjet ink on page 4.
	Video Spectral Comparator (VSC)	Observations made during VSC examination included variations in visible fluorescence and IR properties between the printing on pages 1-3 and page 4, misalignment of margins (via transmitted light/overlay), and inconsistencies in paper fiber content of pages 1-3 compared to page 4 (via fluorescence).
F3L99M	Visual Examination	Visual inspection disclosed that print quality on page 4 is different from pages 1-3. The background text CENTRE SQUARE UNIVERSITY is much fainter and diffuse on page 4 than pages 1-3. The substantive text entries on page 4 are thicker and not as crisp as the entries on pages 1-3. The signatures show embossing on the back of pages 1-3 whereas none is observed on page 4. This can also be felt with the finger on pages 1-3 but not on page 4.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	Microscopic examination disclosed that pages 1-3 have original black non ballpoint ink signatures (likely a roller ball pen or a hard fibre tip pen capable of leaving an indentation) whereas the signature on page 4 is a non original signature which has been printed using colour ink jet technology. The fainter and more diffuse background text CENTRE SQUARE UNIVERSITY and the thicker, more diffuse substantive text entries with a CMY halo (instead of just black ink as per pages 1-3) on page 4 are consistent with being a second generation reproduction using colour ink jet technology.
	Ultraviolet Light	UV examination of pages 1-4 disclosed that pages 1-3 are consistent with each other but that a different type of paper was used to produce page 4. Page 4 is much brighter than pages 1-3, likely due to optical brighteners in the paper stock used for page 4.
	Micrometer	All four pages have an average thickness of .09 mm. Three readings were taken for each page. The four sheets all have the same approximate thickness.
	Oblique Light	Oblique lighting on the back of each page in the area of the signature disclosed ridges on pages 1-3 but not on page 4.
	Video Spectral Comparator (VSC)	VSC examination using the Foster and Freeman V4 model. IR examination disclosed that the signature on pages 1-3 disappears at 780 nm using the FSI slide filter but remains dark on page 4. The signature on page 4 reacts differently than the signatures on pages 1-3. This was also confirmed with IR spot examination. IR spot examination with camera filter at 830 nm, lighting filter at 400-540 nm and 5 sec. integration showed weak luminescence in the signatures on pages 1-3 whereas the signature remained black on page 4. IR spot examination with camera filter at 665 nm, lighting filter at480-620 nm and .3 integration disclosed a much denser concentration of luminescent fibres in the paper used for page 4 as opposed to pages 1-3, which all had fewer luminescent fibres. A different paper stock has been used to produce page 4.
	[No Methods Reported.]	The formatting of the Fall 2024 entries on page 4 is different from all the other entries on pages 1-3 and the Summer 2024 entries on page 4 in that there is an extra space after the program information and the courses. It is possible that a line was deleted and marks were amended. The line re the awarding of the degree is also much smaller than the foregoing text and should be checked against an official transcript to see if it is in keeping with university formatting.
F73K64	Handwriting Examination	The signatures on the first three pages were executed with a ballpen, whereas the signature on the fourth page appears to have been produced by an inkjet printer.
	Infrared Light	The infrared characteristics of the underprint section on the fourth page are different.
	Magnification	We examined the dimensions of the parts/elements/components on the pages, as well as their relative positions.
	Macroscopic/Microscopic Examination	We examined every page of the document and all printed components.
	Oblique Light	On the first three pages, we observed pen pressure grooves at the signature areas, whereas no such impressions were present on the fourth page.
	Thickness	We also examined the thickness of the paper.

TABLE 2

WebCode	Methods/Techniques	Observations
	Transmitted Light	When examined under transmitted light, differences were observed in opacity and density of the fourth page compared to the others.
	Ultraviolet Light	A minimal difference was observed in the UV characteristics of the paper material on the fourth page.
	Video Spectral Comparator (VSC)	We examined all the pages using all available methods.
	Visual Examination	We also reviewed the document by visual examination, and differences were observed on the fourth page.
	Raman spectroscopy	Based on their Raman spectra, the inks on the first three pages are chemically indistinguishable, whereas the ink on the fourth page exhibits a different molecular composition.
F8UE4T	Macroscopic/Microscopic Examination	Alignment inconsistencies were observed amongst the Item 1 (Item Q1) pages. The 'Authorized By' signature on page 4 was a printed, non-original signature while the signatures on pages 1 through 3 were original signatures. Printing inconsistencies were observed when comparing pages 1 through 3 with page 4 (e.g., black text vs. CMYK, crispness/quality of printing).
	Video Spectral Comparator (VSC)	Optical inconsistencies were observed when comparing pages 1 through 3 with page 4 using IR and IR luminescence (e.g., page numbers, borders, background printing, paper fibers).
	Indented Writing	No indented writing of value was observed using oblique lighting and/or electrostatic processing. (The indented writing visualized on pages 1 through 3 using the ESDA was attributed to the signature on the front of each respective page. No indented writing was observed on page 4.)
F96GRC	Vacuum box	Tool marks on the back of page 3
	Video Spectral Comparator (VSC)	Printing technique: inkjet on pages 1, 2, 3 et 4 but rendered differently on page 4. Original signatures on pages 1, 2 and 3 and printed on page 4 Different font size on page 4. Under UV: marks on the back of pages 1 and 2. Under infraredlight: On pages 1, 2 and 3 the background disappears at 780 nm, while on page 4 it still appears at 925 nm. Under transmitted light: the text frame on page 4 does not overlap perfectly with those on pages 1, 2 and 3
	Visual Examination	The background colours on page 4 are different. The paper is whiter
FC4RNC	Infrared Light	Paper absorption under IR light - The page border and printing in Page 1, 2 & 3 becomes faint when viewed in infrared, whereas the page border and printing is solid in Page 4 under IR light.
	Ultraviolet Light	Paper fluorescence under UV light - Page 4 fluoresces brightly when placed under UV light, Pages 1, 2 & 3 fluoresce the same but do not exhibit the same brightness as Page 4 when placed side by side under UV light.
	Magnification	Background printing - The background printing in Page 4 is faded/lighter in color but Pages 1, 2 & 3 have a much darker background printing. Font style - A similar font style was used on Pages 1, 2 & 3. A different style (bolded text) was used on Page 4.
FDMJWW	Microscopic Examination	Page 4 is a different printing process than pages 1, 2 and 3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Signatures on pages 1, 2 and 3 are original wet-ink signatures. Signature on page 4 is NOT an original wet-ink signature. UV properties of page 4 is slightly different than pages 1, 2 and 3. Numerous luminescent fibers/material present in the paper of page 4. Much fewer in pages 1, 2 and 3.
	Indented Writing	No indented writing developed.
	Overlays	No differences noted in formatting or alignment of text.
FHV2XB	Video Spectral Comparator (VSC)	1.The printing method of pages 1;2 and 3 differs with that of page 4. 2.The background printing of pages 1;2 and 3 differs with that of page 4. 3.The borderlines reaction under infrared (IR) of pages 1;2 and 3 differs with that of page 4. 4.The ink reaction under infrared (IR) of the signatures on pages 1;2 and 3 reacts different as compared with that of page 4 .
FNWDP2	ESDA	The latent writing examinations (oblique + ESDA) reveal the signatures on pages 1 to 3 as well as portion of the headings in black while page 4 has the entire background printed in negative and no signature.
	Macroscopic Examination	Macroscopic examinations reveal a difference in appearance for P-4, which is pinker and less crisply printed. The paper on page 4 is also paler in color and presents a different agglomeration pattern.
	Micrometer	Microscopic examinations reveal handwritten signatures on pages 1-3 while the signature is printed on page 4. The black on pages 1-3 is pure black while page 4 is a composite black.
	Video Spectral Comparator (VSC)	VSC examinations reveal a difference in UV and IR behavior for page 4 vs. pages 1-3. On the back of pages 1-3, there is also an irregular but consistent streak from one page to the other, darker in UV. In IR, some fibers are more visible on page 4.
	Transmitted Light	Paper present a different agglomeration patter on P4 then on pages 1 to 3 Very slight horizontal misalignment on page 4 vs page 1 to 3.
	Thickness	Thickness coherent from page 1 to 4
FUNHMC	Microscopic Examination	The color, thickness of ink and background printing of pages 1, 2 and 3 are the same. Page 4 is different in color, thickness of ink and background printing to the rest of the pages.
	Video Spectral Comparator (VSC)	The color, thickness of ink and background printing of pages 1, 2 and 3 are the same. Page 4 is different in color, thickness of ink and background printing to the rest of the pages.
	ESDA	There are no indentations on page 1, 2, 3 and 4.
G4Q3MJ	Macroscopic/Microscopic Examination	1) Signatures on pages 1 to 3 were observed to be hand-written in ink, while the page four signature was machine-printed much like the remainder of the page. 2) page 4 was produced using a whiter paper then pages 1-3. 3) Print quality, in general, of page 4 was poor than observed on pages 1-3. 4) General alignment of page components was perfect for pages 1-3, but out of alignment for page 4.
	ESDA	No discernible impressions were found on pages 1 to 4.
	Video Spectral Comparator (VSC)	Pen ink used for signatures on pages 1 to 3 becomes transparent at 715 nm, while page 4 signature, being printed, continues to be visible at much longer wavelengths. Paper difference also observed for page 4 using spot fluorescence.

TABLE 2

WebCode	Methods/Techniques	Observations
G9KWKK	Visual Examination	The location of the "Verified by" line on Pages 1-3 is different on each page. The placement of the printed line for signing is different on Pag 1 compared to the other two pages. I want to see genuine transcripts from Central University from this time period to assist in determining if these are just variations or true differences. The signature on Page 4 is "Authorized" rather than "Verified," but again, known transcripts are needed to assess the meaning of this observation. In addition, on Page 2 the left margins for the Summer 2022 and Fall 2023 entries are different from the other entries. Also, the "Fall 2023" entry on Page 2 should be fore "Fall 2022." The Fall 2023 entry is in its proper sequence on page 3. And lastly, the total number of Points (27.7) reported on Page 1 appears to be illogical, but can not be so determined without examination of known transcripts.
	Macroscopic/Microscopic Examination	Both of these examinations show differences in the machine printing of Page 4 as compared to pages 1-3 with the clarity of detail in the logo and in the background printing lacking in Page 4 compared to Pages 1-3. Also, the signatures on Pages 1-3 are wet ink signatures, but the signature on Page 4 is machine printed.
	Infrared Light	The paper of Page 4 shows luminescent flecks throughout the page with IRL examination. These flecks are not observed on Pages 1-3.
	ESDA	ESDA examination further supports the proposition that the signatures on Pages 1-3 are wet ink signatures, while the signature on Page 4 is machine printed.
	Micrometer	No significant differences were found in paper thickness among the four pages of the questioned document.
GGX9DC	METHOD: Documents Alteration (Observation, analysis, item´s classification, item´s material and graphics assessment)	The page number 4, has a different impression that the pages 1, 2 and 3.
	[No Methods Reported.]	The page number 4 was removed and a new page number 4 was added.
GQ6NJJ	Visual Examination	1. All four-pages of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) showed similar paper characteristic in size (27.9 cm X 21.6 cm). 2. There is one handwritten entry which is signature observed on four-pages of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer).
	Indented Writing	1. No Indented handwriting was deciphered on all four-pages of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer).
	Video Spectral Comparator (VSC)	1. The 'pg. 4' of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) showed different appearances observed on from 'pg. 1' to 'pg. 3' when exposed to 254nm ultra-violet light, 312nm ultra-violet light and fluorescence light.

TABLE 2

WebCode	Methods/Techniques	Observations
	Examination of Printing Process	1. The printing process of all four-pages of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) are similar to those printed by ink-jet printing process. 2. The 'pg. 4' of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) showed different ink-jet printing characteristics on from 'pg. 1' to 'pg. 3' when exposed to filter 925nm of flood light. 3. Upon magnification, ink scattered on the 'pg. 4' of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) showed different characteristics from 'pg. 1' to 'pg. 3'. 4. The signature entry on 'pg. 4' of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) was printed by ink-jet printing process. However, for the signature entry 'pg. 1' to 'pg. 3' of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) were handwritten using black ink pen.
GRZ7LK	Microscopic Examination	The first three pages of the transcript had signatures written with original ink. Page four had a non-original signature, printed with toner technology. The first three pages of the transcript had text printed with inkjet printing. The fourth page of the transcript had text printed in a with toner technology.
	Ultraviolet Light	Pages 1, 2, and 3 had a darker UV response than page 4, suggesting (although not conclusive) page 4 came from a different paper source.
	Ruler	The rectangular box surrounding each page had exacting margins for pages 1, 2, and 3. The fourth page had the rectangular box measuring 1mm higher on the page.
GTB7ML	Visual Examination	General observations were made about the 4 x page document: - Colour printed 4 page document, containing a signature on each page. - Does not appear to contain any security features on visual inspection (printed text and logos only). - Plain paper of standard letter size (~ 216 x 279mm) . - Page 4 appears to be slightly different colour compared to Pages 1-3 under normal lighting
	Macroscopic/Microscopic Examination	Microscopic examination: - All 4 x pages have been printed using inkjet printing process - Page 4 showed differences to Pages 1-3 under magnification: • Page 4 (CMYK text and background) shows different inkjet printing characteristics compared to Pages 1-3 (black only text, CMYK background). • Signatures on Pages 1-3 produced using black fluid ink (i.e. original signatures) compared to signature on Page 4 being an inkjet printed reproduction of a signature. • Pages 1-3 contains initials/abbreviated form of signature compared to a full/extended signature on Page 4
	Video Spectral Comparator (VSC)	VSC/optical examination: - Differences observed between Page 4 and remaining Pages 1-3 • Colour difference observed in Page 4 paper • Transmitted light showed colour/density difference in Page 4 paper • Fluorescent paper fibres visible under IRL on Page 4 were of higher intensity and quantity • Printed entries on Page 4 showed different IRR/IRL reactions - In summary, Page 4 exhibits different ink and paper features/reactions compared to Pages 1-3
	ESDA	Indentation/ESDA examination: - No visible indentations observed under oblique lighting. - No indentations detected using ESDA.
H9FYMU	Visual Examination	Colour and print quality differences observed on page 4 compared to pages 1 to 3. Some variation in horizontal and vertical alignment was observed within pages 2 and 3. "Fall 2023" is repeated on pages 2 and 3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	The text on page 4 is colour process black printing whereas the text on pages 1 to 3 is printed using all black ink. Slight indentations were observed with oblique light in the handwritten ink signatures on pages 1 to 3. The signature on page 4 is colour process black printing.
	Ultraviolet Light	Page 4 has a brighter response under UV light than pages 1 to 3.
HC3JTX	Macroscopic Examination	No significant differences in the tint of the paper between pages 1-3, page 4 has a different tint.
	Microscopic Examination	Similarities in the details of the inkjet printing were observed on pages 1-3 (similar print head defects). The inkjet printing of the page 4 differs. On pages 1-3 the signature is made with a pen. On page 4 the signature is inkjet printed.
	Infrared Light	Differences were observed in properties of the inkjet printing under IR light when page 4 was compared with pages 1-3.
	Ultraviolet Light	Differences were observed in properties of the paper material under UV light when page 4 was compared with pages 1-3.
	Oblique Light	The examination in oblique light supports the observation that the signature on pages 1-3 is made with a pen (indentations from the pressure of the pen stroke were observed). On page 4, no indentations were observed.
	Transmitted Light	The formation of the paper on page 4 differs from pages 1, 2 and 3.
HH8H4N	Visual Examination	- The signatures on pages 1, 2 and 3, specifically to the right of the expression “Verified by:” are handwritten and have been made using a black ink writing tool. The groove produced by pressure with this tool is perfectly visible on the front of each page, as well as the relief on the reverses. On the other hand, on page 4, the signature following the expression “Authorized By” is not handwritten, but printed. - The height of the sheet of paper used for page 4 is less than the height of the other three sheets. (0.5mm < difference in height < 1mm). It is also a whiter shade. - The rectangular frame included on all pages of the document has significantly different distances to sheet edges on page 4 compared to the other three pages.
	Microscopic Examination	- The inkjet printing on the first three pages and the appearance it gives them are in stark contrast to the completion of page 4. Page 4 has not been printed simultaneously with pages 1, 2 and 3. - Differences in the interlacing of the paper fibers are observed.
	Video Spectral Comparator (VSC)	- The fluorescence of page 4 is different.
HMHNG9	ESDA	When exposed to the electrostatic detection process, page 4 reacts different from pages 1 to 3.
	Magnification	The printing on page 4 of the document differs from the printing on pages 1 to 3.
	Magnification	The signature on page 4 is not a real signature but has been printed.
	Video Spectral Comparator (VSC)	When exposed to specialised light sources, page 4 of the document reacts differently to pages 1 to 3, an indication that page 4 is not the same kind of paper as pages 1 to 3.
HNAPKC	Microscopic Examination	All 4 pages produced with ink-jet but the general appearance of the printout of page 4 differs a lot from the rest. Signature on page 4 in ink-jet, on the rest of the pages written by hand with pen.

TABLE 2

WebCode	Methods/Techniques	Observations
	Transmitted Light	The paper in page 4 has a fiber composition that differs from the rest.
	Ultraviolet Light	The paper in page 4 has a more powerful UV-fluorescence than the rest.
HRATEJ	Macroscopic/Microscopic Examination	Pages 1-3 produced using inkjet technology, with original black ink signatures. Page 4 produced using toner technology, including the signature
	ESDA	No indentations detected
	Video Spectral Comparator (VSC)	Pages not UV dead. No alterations to text determined
HYR93M	Visual Examination	• It is observed a different printing tone on page four compared with pages 1, 2, and 3. • An illegible signature on black is observed on the four pages. • On page four, a signature with a different design compared with the other pages, is observed
	Microscopic Examination	Below, a detailed study was carried out, with the aid of a specialized analysis equipment (Leica M80 microscope), with different magnifications, with the purpose of locating a possible existence of alteration evidence, observing the following: - With different magnifications, it is observed that page 4 has a lower printing quality compared with the first 3 pages. - The signature on page 4 is observed to be printed compared with the ones on pages 1, 2, and 3, that are original/handwritten.
	Video Spectral Comparator (VSC)	Afterwards and with the aid of a specialized analysis equipment (spectral comparison video), the following is observed: - With raking light, no liftings on the paper fibers are observed, on the "Verified by" section, the ridge of the autograph signature is observed of pages 1, 2, and 3, observing that on page 4 there are no ridges on the printed signature. - With transmitted light no reduction on the paper fibers is observed. - With UV light the presence of substances or variation on the support material of the paper is not observed. - With infrared light on pages 1, 2, and 3, it is observed the absorption of the ink regarding the security background, center Square University logo, autograph signature, as well as the numbering on the left lower part; regarding the autograph signature, the ridge made by the person who signs. Regarding page 4, it can be appreciated the absorption of the ink on the security background, regarding the Cener Square University logo, no full absorption is observed, as well as the ink absorption of the signature nor ridge are observed.
JA7H77	Visual Examination	Similarities observed;- •The pages 1- 4 of item 'Q1' were all intact bearing no physical tears, no crossings or erasures made to the typewritten content on each page. •Similar margin habits were also observed on all four pages of item 'Q1' •The positioning of the watermark logo and similar words on the transcript was the same. For instance, the wordings 'Center Square University', 'Centerlande, Ohio', 'OFFICIAL TRANSCRIPT' at the top center of the document. •The font type and size of the typewritten content on each page of the transcript was the same Differences observed;- •The colour shade of the circular watermark of the university logo ('CENTER SQUARE UNIVERSITY') and the background wording on page 4 was different from that on pages 1-3. •The signature on page 4 of the transcript was a long form whereas the ones on pages 1-3 were all short form signatures.
	Microscopic Examination	•The printed text on pages 1,2,3 was characterized by uneven rough edges on the characters whereas that on page 4 had clearer and neater solid characters with a better-quality print.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Under high magnification it was observed that the printed text on pages 1,2,3 was characterised by uneven rough edges on the characters whereas that on page 4 had cleared Using VSC8000 floodlight using various filters and the following observation was made; - •The watermark and signatures disappear on pages 1,2,3 and these stay visible/donot disappear on page 4 under filter at 780nm. • Under the visible oblique light; it was observed that the black ink signatures on pages 1-4 retain their black colour. •Under the Infra-red oblique light; it was observed that the black ink disappears on page 1-3 exposing impressions created by the writing implement during the signing process. On page 4 of item 'Q1' the black of the signature dose not disappear and no impressions are seen.
JD8LV9	ESDA	Toner particles on pages 1 – 3 are not clearly accumulated as compared to page 4 during ESDA analysis.
	Video Spectral Comparator (VSC)	Pages 1 – 3 reflect different under UV lighting as compared to page 4.
	Magnification	The signatures on pages 1 - 3 are genuine signatures and the signature on page 4 is printed.
	Magnification	Pages 1 - 3 contain good quality printing and page 4 has poor printing quality.
JFYMYB	Visual Examination	Signs of alteration observed in Q1. Visual light was used to examine and compare the four (4) pieces of paper, signatures (original writing/inkjet), and inkjet printing. Page 4 (Q1-4) had observed differences from pages 1 through 3 (Q1-1, Q1-2, Q1-3). No differences were observed between pages 1 through 3 (Q1-1, Q1-2, Q1-3). Paper: No areas of disturbance in the paper. I did not observe any thinner than normal areas on the pages of Q1 that would suggest potential alternations. The pages of paper were consistent throughout each page. The color of the paper is white for all four pages of Q1. Size of the paper is consistent in Q1. Back of all Q1 pages was blank. No texture was observed on Q1 pages. No staining was observed on Q1 pages. A difference in the opacity was noted in page 4 (Q1-4) when compared to pages 1 through 3 (Q1-1, Q1-2, and Q1,3). Pages 1 through 3 (Q1-1, Q1-2, Q1-3) had the same opacity. Pages 1 through 3 (Q1-1, Q1-2, Q1-3) had a lower opacity than page 4 (Q1-4). Signatures (original writing/inkjet): Original writing (signatures) was present on pages 1 through 3 (Q1-1, Q1-2, Q1-3). No original writing was present on page 4 (Q1-4). No original writing (signatures) difference observed (macroscopic or microscopic) between the inks present on pages 1 through 3 (Q1-1, Q1-2, Q1-3). The signature on page 4 (Q1-4) was inkjet printed text. Inkjet: A difference in the inkjet patterning was observed between page 4 (Q1-4) and pages 1 through 3 (Q1-1, Q1-2, Q1-3). No different was observed in the inkjet patterning between pages 1 through 3 (Q1-1, Q1-2, Q1-3).

TABLE 2

WebCode	Methods/Techniques	Observations
	Transmitted Light	Signs of alteration observed in Q1. Utilized the transmitted light setting on the Video Spectral Comparator to examine and compare the four (4) pieces of paper, signatures (original writing/inkjet), and inkjet printing. Page 4 (Q1-4) had observed differences from pages 1 through 3 (Q1-1, Q1-2, Q1-3). No differences were observed between pages 1 through 3 (Q1-1, Q1-2, Q1-3). Paper: No watermark present on Q1. No thin disturbed areas observed on the Q1. It was noted that the opacity of page 4 (Q1-4) was different than the opacity observed between pages 1 through 3 (Q1-1, Q1-2, Q1-3) under transmitted light. Pages 1 through 3 (Q1-1, Q1-2, Q1-3) were observed to have the same opacity under transmitted light. Signatures (original writing/inkjet): No differences were observed for signatures with transmitted light. Inkjet: No differences were observed for inkjet printing on pages with transmitted light.
	Ultraviolet Light	No signs of alteration observed in Q1. Used the Ultraviolet setting (365nm) on the Video Spectral Comparator to examine and compare the four (4) pieces of paper, signatures (original writing/inkjet) and inkjet printing. Paper: No optical differences observed in the paper characteristics when comparing the four (4) pages of Q1. All pages of Q1 were found to be UV bright under UV (365nm). No stains or discoloration were observed in Q1 paper. Signatures (original writing/inkjet): No optical differences under UV (365nm) were observed in the original writing (signatures) for pages 1 through 3 (Q1-1, Q1-2, Q1-3). It should be noted that no difference was observed under UV (365nm) between the writing ink signatures on pages 1 through 3 (Q1-1, Q1-2, Q1-3) and the inkjet ink printed signature on page 4 (Q1-4) under UV (365nm). Inkjet: No optical differences under UV (365nm) were observed in the printed ink on Q1.
	Infrared Light	Signs of alteration observed in Q1. Used the infrared reflectance (IRR - 850nm) and infrared luminescence (IRL) setting on the Video Spectral Comparator to examine and compare the four (4) pieces of paper, signatures (original writing/inkjet), and inkjet printing. Paper: A difference in the IRL material was observed between pages 1 through 3 (Q1-1, Q1-2, Q1-3) and page 4 (Q1-4). It was found that page 4 (Q1-4) had more infrared luminescent fibers than pages 1 through 3 (Q1-1, Q1-2, Q1-3). A difference in the opacity of pages 1 through 3 (Q1-1, Q1-2, Q1-3) and page 4 (Q1-4) was observed under IRR (850nm). Pages 1 through 3 (Q1-1, Q1-2, Q1-3) had the same opacity. Pages 1 through 3 (Q1-1, Q1-2, Q1-3) had a lower opacity than page 4 (Q1-4). Signatures (original writing/inkjet): Original writing (signatures) on pages 1 through 3 (Q1-1, Q1-2, Q1-3) had no observed differences under IRR or IRL. No original writing is present on page 4 (Q1-4). The signatures on pages 1 through 3 (Q1-1, Q1-2, Q1-3) had different IRR characteristics when compared to printed signature on page 4 (Q1-4) under IRR (850nm). No differences were observed in signatures in Q1 under IRL. Inkjet: Differences in the IRR properties of the inkjet present on pages 1 through 3 (Q1-1, Q1-2, Q1-3) and page 4 (Q1-4) were observed. No differences were observed between pages 1 through 3 (Q1-1, Q1-2, Q1-3). under IRR. No differences were observed in IRL properties of the inkjet present on any pages (Q1-1, Q1-2, Q1-3, Q1-4) of Q1.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Signs of alteration observed in Q1. Used the various settings on the Video Comparator to examine and compare the four (4) pieces of paper, signatures (original writing/inkjet) and inkjet printing. Paper: Optical differences were observed in the paper characteristics when comparing pages 1 through 3 (Q1-1, Q1-2, Q1-3) and page 4 (Q1-4) under visual, IRR (850nm), IRL and transmitted light. No optical differences were observed in the paper characteristics when comparing pages 1 through 3 (Q1-1, Q1-2, Q1-3) under visual, IRR (850nm), IRL and transmitted light. No differences were observed between any Q1 paper under UV (365nm). Additionally, no paper disturbances or staining was observed utilizing visual, IRR (850nm), IRL, UV (365nm) or transmitted light. Signatures (original writing/inkjet): No optical differences were observed in the original written signatures appearing on pages 1 through 3 (Q1-1, Q1-2, Q1-3) under visual, IRR (850nm), IRL, UV (365nm) or transmitted. Optical differences were observed in the original written signatures appearing on pages 1 through 3 (1-1, Q1-2, Q1-3) and the inkjet printed signature on page 4 (Q1-4) under IRR and visual (original signature vs. digitally printed). No optical differences were observed between original written signatures appearing on pages 1 through 3 (Q1-1, Q1-2, Q1-3) and the inkjet printed signature under UV (365nm), IRL and transmitted. Inkjet: Differences in the visual (patterning) and IRR (850nm) properties of the inkjet present on pages 1 through 3 (Q1-1, Q1-2, Q1-3) and page 4 (Q1-4) were observed. No differences were observed between pages 1 through 3 (Q1-1, Q1-2, Q1-3). under visual, IRR (850nm), IRL, UV (365nm) and transmitted. No differences were observed in IRL, UV (365nm) or transmitted properties of the inkjet present on any pages (Q1-1, Q1-2, Q1-3, Q1-4) of Q1.
	Thin-Layer Chromatography	Signs of alteration observed in Q1. Used Thin-Layer Chromatography (TLC) to look at the components with the paper and the inkjet to determine if there were any chemical differences in either the inkjet or paper of Q1. Paper: The paper of pages 1 through 3 (Q1-1, Q1-2, Q1-3) exhibited similar characteristics under TLC. The paper of pages 1 through 3 (Q1-1, Q1-2, Q1-3) were chemically indistinguishable at this level of analysis. The paper of page 4 (Q1-4) did not exhibit similar characteristics under TLC to that of the characteristics of pages 1 through 3 (Q1-1, Q1-2, Q1-3). Therefore, page 4 (Q1-4) paper is different than the paper of pages 1 through 3 (Q1-1, Q1-2, Q1-3). Inkjet: Inkjet ink present on pages 1 through 3 (Q1-1, Q1-2, Q1-3) exhibited similar characteristics under TLC. The inkjet ink used for pages 1 through 3 (Q1-1, Q1-2, Q1-3) were chemically indistinguishable at this level of analysis. The inkjet ink present on page 4 (Q1-4) did not exhibit similar characteristics under TLC to that of the inkjet ink on pages 1 through 3 (Q1-1, Q1-2, Q1-3). Therefore, page 4 (Q1-4) inkjet ink is different than the paper of pages 1 through 3 (Q1-1, Q1-2, Q1-3).
JGPNZT	ESDA	ESDA and oblique light examinations revealed nil unsourced indentations.
	Macroscopic/Microscopic Examination	The printing on page 4 is dissimilar to the printing on pages 1-3. The signatures on pages 1-3 are original while the signature on p.4 is a reproduction.
	Video Spectral Comparator (VSC)	When examined under IR luminescence settings using the spot light, p.4 appears darker and has a greater number of luminescent fibres as compared to pages 1-3. When examined under IR absorption settings using the flood light, the background printing on page 4 was revealed to react dissimilarly to pages 1-3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Micrometer	There were nil significant dissimilarities re the weight and thickness of the pages.
JHZTEG	Visual Examination	The four pages of Q1 have grades for different subjects running from Fall 2020 through to Fall 2024. I note that on Page 2 there are no details for Summer 2021 and the entry after Spring and Summer 2022 is for Fall 2023 and not for Fall 2022 as it should be if in sequence. On Page 3 there are details for Spring, Summer and Fall 2023 meaning that there are apparently two different sets of results for Fall 2023. I have been informed that these discrepancies are an error which should have no effect on the examination. I also note that there are misalignments in the text on Page 2; for example, the position of certain details for the bottom two entries regarding Summer 2022 and Fall 2023 are closer to the left edge of the paper than others and the gap between entries for Spring 2022 and Summer 2022 is less than for other sets of entries. Additionally on Page 4 I found that there is a bigger gap between the final set of results and the heading for these results and the text regarding 'Degree Awarded...' appears 'squeezed' in. I found that the colour of the printing on Page 4 of Q1 differs from the other pages. This is particularly noticeable in the background 'logo' . The colour of the paper of Page 4 also differs slightly from the other pages.
	Macroscopic/Microscopic Examination	Whilst I found that all four pages are nominally US letter size, I found that Page 4 is shorter in length than the other pages. I found that all of the details on Page 4, including the signature, are produced using an ink-jet printer (i.e. the signature on Page 4 is not an original, 'wet' ink signature). I found that the signatures on Pages 1 to 3 are original, 'wet' ink signatures; the remaining details on these pages are all produced using an ink-jet printer. Additionally, the signature on Page 4 differs in its overall appearance from those on Pages 1, 2 and 3. I found that the text and background printing on Page 4 looks less 'sharp' than that on Pages 1 to 3. I also note that whereas the main body text on Pages 1, 2 and 3 is printed in black only, the equivalent text on Page 4 is a mixture of black and colour ink-jet. I found the microscopic background colour dot pattern on Pages 1, 2 and 3 match one another indicating that these pages were printed from the same specific electronic file using an inkjet printer with the same specifications and settings. I found the microscopic background dot pattern on Page 4 to be different from the other pages.
	Video Spectral Comparator (VSC)	I found that the paper of Page 4 differs from the other pages in terms of its appearance when viewed with transmitted light and UV light. I also found that Page 4 has many more luminescent fibres than the other pages of Q1. Though I found that Page 4 is different paper and therefore any comparisons must be treated with caution, when viewed under specialised lighting conditions, I found differences in the reaction of the ink-jet inks between Page 4 and the other pages.
	Overlays	I found similarities between the typestyle and size used in equivalent areas of the four pages of Q1 except for the printing on Page 4 of the text 'Degree Awarded:…' and that associated with the signature. I found differences in the typestyle of the text for the 'Degree Awarded...' compared with the surrounding text and differences in the spacing of characters. I found differences in the size of the text associated with the signature on Page 4 compared with surrounding text and I note that on Pages 1 to 3 the signature is on the right of the page preceded by the text 'Verified by:' whereas on Page 4, as well as the signature not being original, the preceding text reads 'Authorized By:'

TABLE 2

WebCode	Methods/Techniques	Observations
	ESDA	I examined the four pages for the presence of any indented impressions using both oblique light and ESDA. I found no decipherable indented impressions of writing on any of the pages. I found apparent paper handling marks on Pages 1, 2 and 3, which are not present on Page 4.
JL3QMN	ESDA	No indented writing observed on any pages however latent images were observed on pages 1-3.
	Microscopic Examination	Determined pages were color inkjet printed and signatures on pages 1-3 were original and signature on page 4 was inkjet printed. Noted background differences in color with page 4.
	Video Spectral Comparator (VSC)	Pages reacted similarly to UV reactions. Pages 1 through 3 had latent markings on back in UV and page 4 did not.
	Overlays	Differences in alignment and measurements between pages.
JLM6F8	ESDA	NO INDENTATION WAS FOUND
	Video Spectral Comparator (VSC)	THE SIGNATURES ON PAGE1-PAGE 3 FADES BUT ON PAGE 4 UNDER IR LIGHT AND ASLO WITH SPOT FLORESCENCE WITH DIFFERENT FILTERS.
	Video Spectral Comparator (VSC)	THE PRINTING ON PAGE1-PAGE 3 IS DIFFERENT WITH THE ONE ON PAGE 4 UNDER FLOOD LIGHT WITH HIGHER MAGNIFICATION.
	Video Spectral Comparator (VSC)	THE PAPERS ON PAGE1-PAGE 3 REACTS DIFFERENTLY UNDER UV LIGHT AS COMPARED TO PAGE 4.
	Video Spectral Comparator (VSC)	THE ALIGNMENT AND LAYOUT ON PAGE1-PAGE 3 IS DIFFERENT TO ON PAGE 4 UNDER FLOOD LIGHT WITH HIGHER MAGNIFICATION.
JXGL69	Video Spectral Comparator (VSC)	The page numbered as “pg. 4” differs regarding fluorescence to that of the pages numbered as “pg. 1”, “pg. 2” and “pg. 3”. The pages numbered as “pg. 1”, “pg. 2” and “pg. 3” fluorescence equally with each other.
	Microscopic Examination	The quality of printing on the page numbered as “pg. 4” differs to that of the pages numbered as “pg. 1”, “pg. 2” and “pg. 3”.
	Microscopic Examination	The signature on the page numbered as “pg. 4” is printed, whereas the signatures on each of the pages numbered as “pg. 1”, “pg. 2” and “pg. 3” are signed with original penned ink.
K2DMLG	Microscopic Examination	Pages 1, 2, and 3 of document Q1 have been identified as having been printed using an inkjet printer. In contrast, page 4 shows signs of having been printed using a different printer.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Front of Document Q1: 1. When applying white light to the documents, a background is observed in the format that includes the legend "CENTER SQUARE UNIVERSITY," accompanied by a logo in the center of the same legend. 2. When applying ultraviolet light (UV, with a wavelength of 254 nanometers), a different hue is seen on the seal and paper on page 4 compared to pages 1, 2, and 3. 3. When applying infrared light (IR, with a wavelength of 715 nanometers), it is observed that on page 4 the background of the cover, the logo in the center, and the signature at the bottom remain visible. However, on pages 1, 2, and 3, the background of the cover, the logo, and the signatures disappear, indicating that the signature on page 4 is not autographed. Back of Document Q1: 1. When applying white light, a different tonality of the paper is observed on page 4 compared to pages 1, 2, and 3. 2. When applying ultraviolet light (UV, wavelength 254 nanometers), a different tonal reaction is observed in the paper on page 4 compared to pages 1, 2, and 3. 3. When applying infrared light (IR, wavelength 715 nanometers), a uniform white tonal reaction is observed across all pages.
K6UYHX	Visual Examination	Visual examination of Exhibits Q1(1), Q1(2), Q1(3) and Q1(4) was conducted.
	Microscopic Examination	Microscopic examinations of Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)a were conducted. The questioned machine-generated entries on Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)a, including the questioned authorization signature, were prepared using liquid inkjet printing technology. The questioned machine-generated entries on Exhibit Q1(1)a were compared with the questioned machine-generated entries on Exhibits Q1(2)a and Q1(3)a. No font differences were observed within the questioned machine-generated entries on Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)a. The questioned verification initials on Exhibits Q1(1)a, Q1(2)a and Q1(3)a were prepared using black non-ball point ink. The questioned paper within Exhibit Q1(4) was compared with the questioned paper within Exhibits Q1(1), Q1(2) and Q1(3). Differences in the properties (i.e., optical or spectral characteristics, density) of the paper within Exhibit Q1(4)(a and b) were observed. The questioned verification initials on Exhibits Q1(1)a, Q1(2)a and Q1(3)a, and questioned authorization signature on Exhibit Q1(4)a are suitable for comparison with submitted known initials and signatures.
	Video Spectral Comparator (VSC)	The questioned inked entries (initials) on Exhibit Q1(1)a were compared with the questioned inked entries (initials) on Exhibits Q1(2)a and Q1(3)a. No ink differences or alterations were observed within the inked entries. The inked entries on Exhibits Q1(1)a, Q1(2)a and Q1(3)a were not distinguishable at this non-destructive level of analysis.
	Indented Writing	Electrostatic Detection Apparatus (ESDA) examination of Exhibits Q1(1)(a and b), Q1(2)(a and b), Q1(3)(a and b) and Q1(4)(a and b) was conducted. Indented handwriting and machine-created impressions were observed on Exhibits Q1(1)(a and b), Q1(2)b and Q1(3)b; however, some of the handwriting impressions on Exhibits Q1(1)b, Q1(2)b and Q1(3)b are not of evidentiary value. Indented machine-created impressions were observed on Exhibits Q1(2)a, Q1(3)a and Q1(4)(a and b); no further indented impressions were observed. Indentation lifts were created to preserve the results of the ESDA examination.
	Digital preservation/processing	The ESDA indentation lifts were digitally preserved and processed. Exhibit Q1 was digitally preserved.

TABLE 2

WebCode	Methods/Techniques	Observations
K7LTHM	Video Spectral Comparator (VSC)	The document is produced on four sheets of commercial bond paper. The backing on pages 1, 2, and 3 has a different fibrous structure than the backing on page 4. Its texture and porosity are also different, allowing for greater ink absorption on page 4. - Transmitted light reveals a difference in the backing's shape and fibrous structure. The backing is the same on pages 1, 2, and 3, but there is a difference on page 4.
	Macroscopic/Microscopic Examination	- The document has regular edges across its four pages. - It does not display any device specific to the medium. - From the above, it can be inferred that the document was not produced entirely on the same medium. - Regarding the document's printouts, it features a letterhead, layout, and background design in color inkjet, in its four primary colors. It should be noted that on page 4, the color distribution is different from that on pages 1, 2, and 3; this indicates that it was printed at a different time or with a different device. - The document is filled out in black inkjet for all four pages. It should be noted that the characters on the printout on page 4 are more inky due to the difference in the medium.
	Infrared Light	- Each page features a signature. Note that on pages 1, 2, and 3, the signatures are handwritten in black ballpoint ink, and on page 4, the signature is digitally printed using inkjet in black and its primary colors. - From the above, and due to the differences in the characteristics found on page 4 compared to pages 1, 2, and 3, it is possible to establish an interleaf addition.
KA76WJ	Video Spectral Comparator (VSC)	After careful examination and comparison of four page Academic Transcript (item Q1) using Video Spectral Comparator (VSC-8000, Software Version 7.2), it is concluded that the four page Academic Transcript (item Q1) has been altered. The conclusion is based on following observations: i. UV brightness of pg. 4 is different from remaining pages of Academic Transcript. ii. Distance between the edge and margin line on pg. 4 is different from remaining pages of Academic Transcript. iii. Printing (background printing and color of the monogram & title) on pg. 4 is different from remaining pages of Academic Transcript. iv. Signature on pg. 4 is non-genuine and has been produced by printing process while signatures on remaining pages of Academic Transcript are genuine and have been executed using writing instrument (pen) /ink.
KHEELX	ESDA	Identations of mechanical origin were revealed on sheets 1 to 3 but not on sheet 4
	paper analyses	The fluorescence of the 4th sheet is different of the other 3. The screens (obtained using Fast Fourier Transform) are not different for the sheets 1 and 3. The screens of the sheet 2 are different from those on sheets 1 and 3 but their patterns are close. The screens of the sheet 4 are different of the other 3.
	Macroscopic/Microscopic Examination	The 4 sheets are inkjet printed, with four-color process (using black, cyan, magenta and yellow inks). Under magnification, the yellow ink has a different color on sheet 4 than on sheets 1 to 3. The signatures on sheets 1, 2 and 3 are in ballpoint pen with black ink, while the signature on sheet 4 is in inkjet. The black border on sheets 1 to 3 was printed using cyan, magenta and yellow inks, while on sheet 4, black ink was also used for the border.
	Raman analysis	The inks used on sheets 1 to 3 are not different from each other, but are different from those used on sheet 4
KJR7CT	Macroscopic/Microscopic Examination	The stereomicroscope at 10x magnification showed pages 1-3 used a different printing process and paper than page 4.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	The VSC page 4 paper fibers reacted differently using spot fluorescence than on pages 1-3; using IR the signature reflected back on page 4 and absorbed on pages 1-3; using UV pages 1-3 had some absorption, where page 4 had no absorption.
	Handwriting Examination	The signature on pages 1-3 was not internally consistent with the signature on page 4. Additionally, the word authorized by: was only on page 4. Pages 1-3 had verified by:.
	Ruler	Margins of Pages 1-4 were measured. The top and bottom margin on page 4 was different from pages 1-3.
	Visual Examination	Pages 1-3 the watermark seal was visually discolored compared to page 4 watermark seal.
KJTVMH	Visual Examination	STAGE ONE. A visual analysis is made to determine any type of alteration that is visible to the naked eye.
	Video Spectral Comparator (VSC)	STAGE TWO By means of specialized equipment, different light sources are applied, as well as magnifications are made to magnify details, where two different printing systems can be appreciated.
	Magnification	STAGE THREE Macrophotographing different parts of each page of the document, we can see on pages 01, 02, 03, an inkjet printing system and on page 04 the use of a laser printing system.
KLEPGX	Microscopic Examination	Pages 1-3 are inkjet printed (background letterhead as well as text) with original liquid ink pen signatures. Page 4 is wholly inkjet printed, including the signature. The inkjet printing on page 4 differed in appearance from that on pages 1-3.
	Video Spectral Comparator (VSC)	The inkjet printing on page 4 contained differences in IRR and IRL responses to the inkjet printing on pages 1-3. The paper of page 4 differs in IRL response to the paper of pages 1-3.
	Ultraviolet Light	The paper of page 4 has a different UV response to the paper of pages 1-3.
	Transmitted Light	The paper of page 4 has different paper fibre distribution to the paper of pages 1-3.
	ESDA	No indentations caused by the original signatures on pages 1-3 were located on any of the pages.
KMA9JY	Macroscopic/Microscopic Examination	ESTEREOMICROSCOPE: The optical evaluation carried out on the substrates, texts, emblems, background and other elements comprising the academic record in question revealed incompatibility in tonal qualities, printing quality, text resolution, details of the central symbol and the signature strokes contained on page 4 of the document, compared to the characteristics observed in the elements on pages 1, 2 and 3 of the record.
	Video Spectral Comparator (VSC)	Checks with infrared light, UV light at different scales, appropriate magnifications, and comparisons confirmed disagreements in details of tonality, spectral, print quality, and text resolution, in the qualities of the central symbol and typology of the signature ink printed on page 4 of the file, compared to the characteristics contained in the elements on pages 1, 2 and 3 of the document.
KV67B8	Nirvis: Infrared	1.To observe if the ink on the document reacts. On "Q1.1", "Q1.2" and "Q1.3" the circle image on the disputed document disappears whereas "Q1.4" the image remains. 2. The ink of the signature for "Q1.1", "Q1.2" and "Q1.3" fades but for "Q1.4" ink does not.

TABLE 2

WebCode	Methods/Techniques	Observations
	VSC: Side lights	1. For the examination of indentations on the disputed academic transcript "Q1.1", "Q1.2" and "Q1.3" there's indentation of signatures and for "Q1.4' no indentation.
	Nirvis: Magnification and White light	1. For the background printing and printing on the disputed academic transcript. For "Q1.1", "Q1.2" and "Q1.3" the printing differs from that of "Q1.4". 2. To measure the distance between words. The distance for "Q1.4" is higher than that of "Q1.1", "Q1.2" and "Q1.3".
	ESDA	No indentation s were fond on the disputed academic transcript.
L8VLBT	Indented Writing	No evidence of significant indented writing impressions were noted on the Exhibit Q-1 item.
	Macroscopic/Microscopic Examination	It has been determined that the Exhibit Q1 pages 1 through 3 were produced with the aid of a full color office machine system that is different from the full color office machine system that prepared the Exhibit Q1 page 4. Further the “Verified by” signatures appearing on the Exhibit Q1 pages 1 through 3 are ink signatures and the “Authorized By” signatures appearing on the Exhibit Q1 page 4 was prepared with a full color office machine system.
	Ultraviolet Light	Page 4 fluoresces brighter than pages 1 – 3.
	Overlays	Typewriter Grids: It appears that the typographic information appearing on the Exhibit Q1 page 4 for the “Summer 2024” through the “End of Transcript” were added through some method of cut and paste.
	Micrometer	The micrometer was used to measure the thickness of each sheet. Pg 1 was slightly less than 0.004" and pages 2 - 4 were about 0.004" thick.
	Video Spectral Comparator (VSC)	Each page was examined with the 464nm setting on the VSC to attempt to visualize the CPS code with negative results.
LBQBTL	Video Spectral Comparator (VSC)	Inconsistent page brightness and inconsistent ink behavior under various filters and alternate light sources
	Macroscopic Examination	Spacing and alignment issues as well as inconsistent quality and color issues with printed ink.
	Microscopic Examination	Non-original vs original signatures
LFB2H6	Visual Examination	no changes to the initial content
	Microscopic Examination	no changes to the initial content
	Ultraviolet Light	no changes to the initial content ; technical falsity is excluded
LGHHEE	Microscopic Examination	Pages 1 - 3 :-print is shiny and sits on the paper. Black characters display feathering at the edges. Page 4 :- Print is duller than pages 1 - 3. Characters do not display feathering at the edges, however, black characters display yellow, blue and pink dots at the edges.
	Microscopic Examination	Pages 1 - 3 :- Signature is pen written which is evident by depression in the middle of the ink stroke. Page 4:- Signature is a printed signature, evident by yellow, blue and pink dots within the line, same as all other features on the document.
	Transmitted Light	No visible watermark displayed on all pages 1 - 4.
	Ultraviolet Light	No UV Sensitive features detected on pages 1 - 4. Paper on all pages fluoresce blue.

TABLE 2

WebCode	Methods/Techniques	Observations
	Infrared Absorption/Reflectance	Pages 1 - 3:- At 715nm the red circular University symbol in the middle of the document disappeared whilst the signatures begin to disappear. At 780nm the signatures on pages 1 - 3 completely disappears. Black print on the document was visible throughout entire range (645nm - 1000nm).
	Infrared Absorption/Reflectance	Page 4:- the red circular University symbol in the middle of the document and the signature at the bottom of the document inclusive of all other black print on the page remained visible throughout entire range (645nm - 1000nm).
	Infrared Fluorescence	Pages 1 - 3 :- no Fluorescent features displayed however the pages fluoresce evenly.
	Infrared Fluorescence	Page 4:- The paper fluoresce in a dot like pattern as if there are "security fibres" in the paper. the red circular University symbol in the middle of the document fluoresce much brighter than the paper. The book in the middle of the university symbol also fluoresce and displays a different pattern to that on Pages 1 - 3.
LQ878W	ESDA	Machine-created indented impressions on Exhibits Q1(1) through Q1(3) were similar; whereas, the machine-created indented impressions on Exhibit Q1(4) were different than Exhibits Q1(1) through Q1(3). Indented handwriting impressions were observed on Exhibits Q1(1)b through Q1(3)b.
	Video Spectral Comparator (VSC)	The inkjet printing process reacted differently between Exhibit Q1(4) when compared with Exhibits Q1(1) through Q1(3). In addition, the paper of Exhibit Q1(4) reacted differently than Exhibits Q1(1) through Q1(3) under ultraviolet.
	Macroscopic/Microscopic Examination	The color of Exhibit Q1(4) is different than the color of Exhibits Q1(1) through Q1(3). The inkjet characteristics of Exhibit Q1(4) is different than Exhibits Q1(1) through Q1(3).
LR3PD4	Ultraviolet Light	Page 4 differs in colour compared to the first three pages under ultraviolet light indicating that it originates from a different batch or source.
	Infrared Light	When the signatures on the four page academic transcript are examined under infrared light, page 1 to 3 fluroresces differently when compared to page 4.
	Microscopic Examination	Microscopic examination on the name of the University revealed a noticeable difference where pages 1 to 3 differ with page 4 in respect of colour and intensity.
	Magnification	The font used on pages 1 to 3 slightly differs to page 4 in thickness and shading on personal details and the rest of the document.
	Transmitted Light	Under transmitted light, pages 1 to 3 appear to be darker than page 4.
LU7KUL	Video Spectral Comparator (VSC)	Noted differences in optical qualities of pages.
	Macroscopic Examination	Noted differences in inkjet printing of pages.
	Ruler	Noted arrangement differences on pages.
M3VTU3	Video Spectral Comparator (VSC)	paged 1 to 3 are lighter in colour and page 4 is darker in colour.
	Infrared Light	The borderlines on pages 1 to 3 react under infrared light and the borderline on page 4 doesnt react under infrared.

TABLE 2

WebCode	Methods/Techniques	Observations
	Indented Writing	The signatures on pages 1 to 3 are embossed at the back of the page and on page 4 there's no embossement at the back of the page
M7GCY8	Visual Examination	The hue of leaves 1, 2 and 3 appears yellow, compared to leaf 4.
	Microscopic Examination	The printing system on sheets 1, 2 and 3 is of higher quality than the printing system observed on sheet 4.
	Microscopic Examination	On sheets 1, 2 and 3 you can see the ink of the signature, on sheet 4 you can see that the signature is a print.
	Infrared Light	Infrared light at 823 nm, the signature on sheets 1, 2 and 3 disappears, on sheet 4 the signature does not disappear.
M8NUVG	Visual Examination	• Prepared on letter size paper with frame or margin. • Bears the emblem and heading of the institution as a security background. • The document edges are flat and regular. • The content printing apparently is even. • No tearing is observed on the support material. • The texture of the support material has no spots or changes. • The inks that constitute the format of page number “4” have differences regarding the color-scheme compared with the pages number “1”, “2”, and “3”. • The signatures on the pages number “1”, “2”, and “3” are handwritten. • The signature on page number “4” has different characteristics.
	Microscopic Examination	• No additions were observed on the printed text. • On the lines that are part of the handwritten signatures, no retouching exists. • There are no additions on the printing of the signature that is on page number “4”. • The fibers that make up the support material have no abrasion. • “The letterhead”, “margins”, “filling text” as well as the “security background” are made with an inkjet printing system. • The inks that make the format of page number “4” have differences regarding clarity compared with pages number “1”, “2”, and “3”. • The signatures that appear on pages number “1”, “2”, and “3” are handwritten and are made with writing tool. • The signature that appears on page number “4” is printed with an inkjet printing system.
	Video Spectral Comparator (VSC)	• When using raking light on the inks that make the format of page number “4”, they show differences regarding tone and clarity on its printing compared with pages number “1”, “2”, and “3”. • When subjected to a raking light, no lifting nor detriment on its support material is observed. • With transmitted light, no reduction on the fibers of the support material exists. • No differences were observed regarding luminescence of inks that make the printed texts and signatures, however, there was presence of luminescent spots on the front of pages number “1” and “3” when applying ultraviolet light. • The inks that make the imprint of the signature that appears on page number “4”, show differences on the absorption regarding the handwritten signed pages that appear on pages number “1”, “2”, and “3”.
MNWLZ8	Visual Examination	There is a noticeable difference in the colour tone of the background, composed of the repeating pattern of the university name and the central logo, between the first three pages of the transcript and the foruth page. In addition, there is a difference in both the position and the wording of the authorization line: the first three pages contain the pharse "Verified by" next to signature on the right-hand side, while the fourth page uses "Authorized" at the bottom of the page.
	Microscopic Examination	there is a difference in the type of printer used to produce the printed data on the first three pages of the transcript compared to the printer used on the fourth page.

TABLE 2

WebCode	Methods/Techniques	Observations
	Handwriting Examination	The authorization signature on the last page of transcript shows different handwriting characteristics compared to the authorization signatures on the first three pages, indicating that they were written by different individuals.
	Video Spectral Comparator (VSC)	Under UV light the flouresence of the first three pages differs from that of the fourth page, indicating a difference in the type of paper used.
MT9RFE	Visual Examination	The watermark on page 4 was found to differ in tonal quality from those on the other pages. Furthermore, the printed text on page 4 was comparatively heavier in weight.
	Handwriting Examination	Upon examination, the signature on page 3 was found to differ from those on the remaining pages. Although all signatures exhibit general structural similarities, notable variations were identified in the number and direction of ornamental strokes at the initial portion, the curvature of the strokes, the degree of overlap between pen movements, and the overall line quality in the legible areas. These characteristics are indicative of features commonly associated with simulated signatures. The signature on the final page is composed of two distinct segments. The first segment closely aligns in structure with the signatures on other pages, whereas the second segment displays a configuration not present in the other signatures. While certain irregularities are observed in the terminal strokes—suggesting a lack of fluency—the overall line quality and execution do not present definitive evidence of forgery. Accordingly, it is presumed that the signature was authored by the same individual responsible for the signatures on pages 1 and 2, though it was rendered in a stylistically different form.
	GSM	Quantitative measurement indicated that page 2 had a noticeably different paper weight than the remaining pages.
	Magnification	Under magnification, the signatures on pages 1 to 3 exhibited discernible differences from the printed signature lines in terms of ink saturation, bleeding, and surface texture. However, such variations were not observed on page 4.
	Oblique Light	Examination of the reverse side of the signature areas using oblique lighting revealed pressure marks consistent with handwriting on pages 1 to 3. In contrast, no such impressions were detected on the reverse side of the signature on the final page.
	Overlays	When the content outlines were overlaid using the top margins as a reference, the bottom margin of page 4 was found to be positioned higher than those of the other pages. Additionally, an irregularity was observed on page 2, where the beginning of the middle paragraph was located further to the right compared to both the lower portion of the same page and the corresponding paragraph positions on the other pages.
	Ruler	The top margins of the first three pages were consistent, whereas the top margin on the final page was noticeably narrower. Additionally, the bottom margin on the final page was observed to be wider compared to the other pages. Furthermore, the spacing between the middle paragraph and the content boundary on page 2 was found to be wider than in other sections.
	Macroscopic Examination	As part of the macroscopic examination using digital magnification tools, the watermark on page 4 was found to exhibit a less defined halftone pattern compared to the other pages, with markedly fewer blue dots. The resolution of the watermark was lower, and the printed characters displayed softer and less distinct outlines.

TABLE 2

WebCode	Methods/Techniques	Observations
	Solubility test	Following visual inspection, magnified analysis, and macroscopic examination, samples from the printed areas of pages 1 and 4 were taken and tested for solubility in purified water. The sample from page 1 showed solubility, while the sample from page 4 remained insoluble.
	TLC	Ink samples taken from the signatures on pages 1, 2, and 3 were subjected to Thin Layer Chromatography (TLC), and the resulting pigment separation patterns were found to be consistent across all three pages.
MXKEAJ	Visual Examination	Page no.4 differs from pages no.1,2,3 by the color tend of the paper. page no.4 - white, pages no.1,2,3 - white with a gray tint. Page no.4 differs from pages no.1,2,3 by the graphic construction of the signatures. on the page no.4 - simplified signature, on pages no.1,2,3 - signature contains several characters.
	Microscopic Examination	when examining printing elements: - by the shape of the inkjet dye particles: on p.1-3 - jagged, on p.4 - rounded. - density of multi-colored particles per 1 cm2: on p.1-3 - high, on p.4 - low. - density of black dye particles in black elements: on p.1-3 - high, on p.4 - low. method of making signatures: (on p.1-3 - ballpoint pen, on p.4 - inkjet color)
	Video Spectral Comparator (VSC)	When examining in IR rays it was established that the number of luminescent fibers of the paper in page 4 is much higher than in pages 1,2,3. When examining in UV rays it was established that the fluorescence of the paper page 4 is much more intense than pages 1,2,3. When examining in transmitted light it was established that page 4 is less transparent than pages 1,2,3.
MYVGY3	Infrared Light	Signature ink for pg.1 , pg.2 and pg.3 react similar under IR while no signature ink change for pg.4 under IR.
	Video Spectral Comparator (VSC)	There are printing ink similarities between pg.1, pg.2 and pg.3 while printing ink on pg.4 looks different.
	Oblique Light	No Indentation observed on document.
NBLDVU	Visual Examination	-page 4 the paper is a different color and the printer ink appears different in comparison to pages 1, 2, and 3 -the margins on page 4 may be different than the other pages. -the signature on pages 1, 2, and 3 appear to be pen ink and the signature on page 4 may not be pen ink. -page 1, 2, and 3 say "Verified by" and page 4 says "Authorized by" and is located in a different area of the document. -spacing on page 4 after "Fall 2024 College of Science Forensic Science" is different
	Microscopic Examination	-the signature on page 4 is not ballpoint pen while the other three signatures are -the printer ink used on page 4 is muted in color in comparison to pages 1, 2 and 3 -page 4 has a "blurred" appearance to the printing- possibly copied
	Ruler	-approximate measurements of the margins have pages 1, 2, and 3 consistent with a small difference noted on page 4
	Video Spectral Comparator (VSC)	paper used on pages 1, 2, and 3 of item #1 could not be differentiated with various light sources. -paper used on page 4 is different based on UV and spot filter examinations. the background print and school seal ink used on pages 1, 2, and 3 could not be differentiated with various light sources. -the ink used on the background and school seal is different on page 4 based on IR and spot filter examinations. the signatures on pages 1, 2, and 3 were written with black ballpoint pen ink. -the signature on page 4 is a non-original signature.

TABLE 2

WebCode	Methods/Techniques	Observations
NFKRJK	ESDA	Did not obtain any results.
	Overlays	Overlaying pages with transmitted light allowed the misalignment between documents to be observed.
	Visual Examination	Noticing the lack of consistency between the text.
NGR8RB	Oblique Light	embossing of signatures noted on reverse of pages 1 - 3 but absent on page 4
	Indented Writing	embossing of signatures noted on reverse of pages 1 - 3 but absent on page 4
	Visual Examination	differences noted in colour and printing between pages 1 - 3 and page 4. signature on page 4 is non original, not a wet ink signature as on pages 1-3.
	Microscopic Examination	differences noted in colour and printing between pages 1 - 3 and page 4. signature on page 4 is non original, not a wet ink signature as on pages 1-3.
	Video Spectral Comparator (VSC)	differences noted in colour and printing between pages 1 - 3 and page 4. signature on page 4 is non original, not a wet ink signature as on pages 1-3.
NT726P	Visual Examination	No significant observations.
	Oblique Light	No significant observations.
	ESDA	Indentations developed on back of page 3, lower left quadrant.
	Video Spectral Comparator (VSC)	Initials on pages 1 - 3 dropped out using IR Reflectance, no significant observations on page 4. Using IR Luminescence, paper fibers and initials fluoresced on pages 1 - 3, page 4 only fibers fluoresced.
P9T2CF	Microscopic Examination	• The pre-printed text is the result of inkjet printing; • Microscopic examination of the signatures showed that: - For pages 1,2 and 3: the signatures were established directly on the support, using a black ink ballpoint pen; - For page 4: The signatures were not established directly on the support; they result from an inkjet reprographic process.
	Ultraviolet Light	• Examination under ultraviolet light of the four pages revealed no traces of chemical additives.
	Spot Light (725 nm)	• Examination of the questioned paper under fluorescent Spot light revealed the persistence of the signatures on the fourth page, unlike the signatures on the other three pages (1,2 and 3), which had become furtive.
P9XJAE	ESDA	No evidence of indented impressions of the signatures on Pages 1-3 of Q1 indented onto Page 4 of Q1
	Handwriting Examination	The "Verified by" signatures on each of Pages 1-3 of Q1 (original ink) are in a short form, single-element version, whereas the "Authorized By" signature on Page 4 of Q1 (copy format) is in a longer form, double-element version. There are various possible explanations for these differences, such as using a short form "initials" type signature in the "Verified by" area and a full signature for the "Authorized By" area. Another possibility is that only one individual signed the "Verified by" areas, while two individuals signed the "Authorized By" area. Without access to reference signatures by the various party(ies), I am unable to provide an opinion regarding the genuineness or otherwise of the signatures on Q1.
	Indented Writing	See ESDA

TABLE 2

WebCode	Methods/Techniques	Observations
	Infrared Light	See Video Spectral Comparator (VSC) entry
	Macroscopic Examination	"The colours of comparable features on Page 4 of Q1 differ slightly compared to those on Pages 1-3 of Q1. There are some discrepancies in the layout and information presented in Q1. I have been informed by CTS that certain discrepancies are due to mistakes in the production of Q1. For example, the sum of the total Points shown on Q1 Page 1 is ""27.7"" whereas the actual sum of all QPts in Q1 is 327.7. This discrepancy is a known mistake and I have been advised that it is not relevant to the examination of Q1. Likewise there are two lists of ""Fall 2023"" results on different pages in Q1. This discrepancy is also a known mistake and I have been advised that it is not relevant to the examination of Q1."
	Macroscopic/Microscopic Examination	"Other than the signatures on Pages 1-3 of Q1 (original black pen ink) the remaining details of Pages 1-3 of Q1 are consistent with being printed using inkjet technology. On Page 4 of Q1 all details are consistent with being printed using inkjet printing technology, including the signature. Black features, including the signature, are composed of black and colour dots on this page (Page 4). The appearance of the Page 4 print is significantly different from that of the equivalent print of Pages 1-3. The quality and dot composition of features in Pages 1-3 of Q1 are closely similar where comparable. The quality and dot composition of comparable features on Page 4 of Q1 are different (more degraded) than those on Pages 1-3 of Q1. I find that the majority of the variable black text on all pages of Q1 is consistent with the use of the typestyle ""Lucida Sans Typewriter"" (typed at various sizes with some parts in bold and some in regular). However, I find that the line of text ""Degree Awarded: Bachelor of Science December 13, 2024"" on Page 4 of Q1 shows a different character spacing (more ""condensed"" - i.e. closer together) compared to the surrounding variable black text. Additionally, I find that the exact shapes of characters in this line of text differ from the shapes of equivalent characters elsewhere on the document, although visually they are very similar. "
	Magnification	See Macroscopic/Microscopic Examination
	Microscopic Examination	A Leica Emsperia 3 digital microscope was used. The signatures on Pages 1-3 of Q1 are original ink signatures whereas the signature on Page 4 of Q1 is in copy format produced using colour inkjet printing.
	Oblique Light	See ESDA
	Overlays	Used both with physical transparencies and digital overlays to align and overlay equivalent texts and retypings of the text.
	Ruler	Although all pages of Q1 are nominally US Letter size (11 inches x 8.5 inches) Page 4 of Q1 measures slightly shorter in both dimensions compared to Pages 1-3 of Q1
	Transmitted Light	Used in VSC examination to look at paper characteristics.
	Ultraviolet Light	Using a Foster and Freeman Crime Light (82S, 350-380nm) I find that the UV luminescence of the paper of Page 4 of Q1 is different to the UV luminescence of Pages 1-3 of Q1.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	A VSC 6000 HS was used. The paper of Page 4 of Q1 shows more luminescing fibres per unit area than the paper of Pages 1-3 of Q1 when viewed under Infrared luminescent lighting. The ink of the signatures on Pages 1-3 of Q1 becomes transparent when viewed under Infra Red Light whereas the signature on Page 4 of Q1 does not. The inks of the background text printing (UNIVERSITY CENTER SQUARE) in Pages 1-3 of Q1 becomes transparent when viewed under Infra Red Light (830nm) whereas the equivalent text on Page 4 of Q1 does not.
	Visual Examination	See Macroscopic and Macroscopic/Microscopic Examinations
PCU62G	Magnification	As a first step, magnifying glasses were used to view all the pages of the document under study (the academic record provided by Ms. Susan Smith).
	Video Spectral Comparator (VSC)	The Spectral Video Comparator equipment was used to perform a detailed analysis of the printing systems present on the four pages of the academic record provided by Ms. Susan Smith; it was also used to verify the originality of the signatures.
	Visual Examination	Through visual inspection, the different chromatic tonality between folios 1, 2, 3 and folio 4 can be observed.
PEHED4	Visual Examination	Se observa diferente tonalidad de la impresion de la hoja 4 respecto de la 1, 2 y 3. [Translation by CTS: A different tone can be seen in the print on sheet 4 compared to sheets 1, 2, and 3.]
	Microscopic Examination	- Se observo que la firma de la hoja 4 se encontraba impresa con sistema laser policromatico. - Se observo diferente calidad de la impresion de la hoja 4. [Translation by CTS: It was observed that the signature on sheet 4 was printed using a polychromatic laser system. Different print quality was observed on sheet 4.]
	Video Spectral Comparator (VSC)	Se verifico la diferente calidad de impresion. [Translation by CTS: The different print quality was verified.]
PL68MH	Magnification	Direct observation is initially carried out with the use of a magnifying glass.
	Video Spectral Comparator (VSC)	Direct observation is initially carried out and subsequently with the support of wide field of view instruments, a document comparator to the documents that read "Center Square University - Centerlande, Ohio" establishing that sheet number 4 presents differences with respect to sheets numbers 1, 2 and 3 in terms of the printing quality of the background texts "UNIVERSITY CENTER SQUARE", in the first three it can be seen in a good quality inkjet system, blue tonality, sheet number 4 on the contrary the printing quality despite being inkjet is of lower quality and the tonality is shown in sepia. Likewise, the coat of arms located in the middle of sheets 1, 2, and 3 is pinkish, as opposed to the brick-colored or orange hue of the coat of arms on sheet 4. The thicker, darker black hue of the variable or formal texts on sheets 1, 2, and 3 is also evident, compared to the thinner, lighter hue of the variable texts on sheet 4. Likewise, the signatures on sheets 1, 2, and 3 are original, while the shape seen on sheet 4 is digitally created.
PMDGEE	Microscopic Examination	Low power microscopy was used to visualise the method of production of the document. Pages 1-3 the signatures are in black liquid ink. Page 4 the signature is printed (not wet ink). The black printing on pages 1-3 appears to be black ink only. The black printing on page 4 is made of the four colours. The 'crest' on page 4 differs in colour from pages 1-3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Used to examine the paper under differing lighting conditions. Under UV light pages 1-3 have a similar brightness to each other. Page 4 is brighter than pages 1-3 (i.e. the page of page 4 differs from pages 1-3)
	ESDA	To determine whether the pages bear any indented impressions which may serve to identify the producer etc. No impressions of value noted on any pages. The 'crest' reacts differently to ESDA on page 4 compared to pages 1-3.
PQDRBE	Microscopic Examination	Microscopic examination shows page 4 to be produced with a different printer than the pervious pages. Furthermore the signature on page 4 is reproduced and not originally executed on the page (unlike signatures on previous pages).
	Oblique Light	ESDA and oblique light examinations shows no indentations of previous pages' signatures on page 3.
	Visual Examination	Paper of page 4 is different from paper on pages 1, 2 and 3.
PW43KD	Infrared Light	Upon examination using infrared light, all four pages (of Q1 document) —including the signatures—exhibited consistent infrared reflectance characteristics. There were no variations in ink luminosity or indications of differential absorption that would suggest the use of different inks or subsequent additions. Specifically, there were no signs of overwriting, added printed text, or alterations detectable under infrared light.
	Ultraviolet Light	Ultraviolet light was employed to examine all four pages of the transcript (Q1) for potential signs of chemical erasures, text tampering, or inconsistencies in printing quality. No detectable signs of the aforementioned alterations were observed. Furthermore, the questioned transcript (Q1) lacked the standard security features commonly found in official academic transcripts, such as watermarks, microprinting, UV-reactive elements, or anti-copy mechanisms.
	Magnification	Magnification was utilized to examine the CMYK dot patterns indicative of photocopy printing, which were consistently observed across all four pages of the questioned transcript (Q1), including in areas surrounding the signatures. While the overall printing quality suggested reproduction, closer inspection confirmed that the signatures themselves were handwritten, not printed.
Q2CM7P	Visual Examination	Inital examination. Noted colour tone similarity of pages 1-3 with page four presenting a tonal difference in the background print noticeable in the crest and continuous text.
	Transmitted Light	No evidence of any alteration to any of the four pages ie damage to paper, use of correction fluid.
	Ultraviolet Light	All pages have similar reaction UV reaction @ 365nm.
	Microscopic Examination	No visual evidence of alteration to paper fibres or print on any page. All machine printed. Noticeable difference in inkjet pattern on page 4 compared to the rest of the pages in QD. Original initials/signature on page 1-3. Non original signature on page 4.
	Oblique Light	No indentations or other evidence of alteration observed.
	Infrared Light	Noticeable difference in print and signature appearance between pages 1-3 and page 4 when exposed to IR light. At 850nm on pages 1 to 3 the background print and signatures drop out while it remains on page 4. Also able to visualise the signature indents on pages 1-3. Signature indents absent on page 4 under IR 850nm.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Images of the techniques utilised in this examination were captured using the Foster and Freeman VSC8000.
QALCL9	Visual Examination	The first three pages of the 4-page academic transcript (“pg. 1 – pg. 3”) have the same paper weight per square meter and the same cross-sectional view. In these parameters the fourth page (“pg. 4”) is different from the first three pages.
	Ultraviolet Light	The paper of “pg. 1 – pg. 3” have the same color under UV light, and the same IR luminescence properties. In these parameters the fourth page (“pg. 4”) is different from the first three pages.
	Microscopic Examination	The graphic and text elements of all pages of the document were displayed using color inkjet technology, however, “pg. 1 – pg. 3” is different from “pg. 4” in terms of the morphology and color of the prints.
	Video Spectral Comparator (VSC)	In the text line “Degree Awarded: Bachelor of Science December 13, 2024” on page 4, the distance between the letters in the phraze “of Science” is different from that observed in the case of the same word combination occurring in two places on the same page, therefore they cannot be made to coincide with each other.
QCANNY	ESDA	Each of the four pages were subject to an examination in the laboratory's ESDA machine. The films showed that the signature on pages 1, 2 and 3 were written with a writing instrument and ink. The signature on page 4 deviated from the first three pages, showing no indentation in the ESDA film. The assessment concluded that the signature on page 4 was not an original signature.
	Ultraviolet Light	Each of the four pages were viewed under UV light (365nm, 312nm and 254nm). Pages 1, 2 and 3 showed similar reactions under each of the UV light band widths. Page 4 showed a visually stronger fluorescence under especially 312nm when compared to the first three pages.
	Infrared Light	Each of the four pages were viewed under different wavelengths in the infrared spectrum in the laboratory's VSC. The text and signatures on pages 1, 2 and 3 had similiar reactions under the infrared light. Page four deviated in comparison. For example, the background printing in page 4 was visible under 695nm and the signature had a darker reaction in comparison to the other pages.
	Video Spectral Comparator (VSC)	The UV spot fluorescence light source in the laboratory's VSC showed that the ink used for the signatures on pages 1, 2 and 3 had a similar absorption appearance, whereas the inkjet printed signature on page 4 deviates in the absorption appearance. See also the answers for the methods UV and IR used in the VSC.
	Visual Examination	The first visual examination under visual light with the naked eye, resulted in the observation that the visual appearance of page 4 deviates in color of the printed text and the characteristics of the printing of the background design when compared to the other three pages. The reverse sides of the pages were also viewed under visual light with the naked eye, and page 4 showed the background printing visible through the paper whereas the other three pages did not.
	Microscopic Examination	A microscopic examination was conducted for all four pages in order to examine the print technique used for each page. All four pages are determined to be printed in inkjet. Pages 1, 2 and 3 showed similar CMYK drop characteristics and patterns. The drop pattern, the closeness of the drops, and the visual characteristics of absorption of the ink into the papers substrate, deviated in page 4 when compared to the other three pages.

TABLE 2

WebCode	Methods/Techniques	Observations
	Oblique Light	Each of the four pages were viewed under oblique light. The examination of the signatures on pages 1, 2 and 3 under oblique light, showed an indentation in the paper substrate. An indentation in the signature on page 4 viewed under oblique light was not observed. The indentations in pages 1, 2 and 3, as well as the lack of an indentation in page 4, were confirmed from the films taken in the laboratory's ESDA machine.
	Indented Writing	See the observations under the methods ESDA and oblique light for indented writing.
	Ruler	The Ruler tool in the laboratory's VSC was used to conduct measurements of the spaces between the letters of text in identical places in the title of the document, the circumference of the circular design in the background printing, as well as the distance from the edge of the paper to the start of the background printing in all four pages. However, the results were inconclusive and not used in the final assessment.
QM8MBY	ESDA	Nothing of evidential value found.
	Video Spectral Comparator (VSC)	Differences in paper colour seen - pages 1 - 3 v 4.
	Macroscopic/Microscopic Examination	Differences in the print - therefore differences in the printer - used to produce pages 1 - 3 v 4. Signature on pages 1 - 3: original Page 4: copied - not original
	Transmitted Light	Differences in the paper seen - although no watermark - pages 1 - 3 have a different appearance cf to 4 when viewed by transmitted light.
	Handwriting Examination	Too small a sample (1-3) to compare against 4.
QMVP4A	Macroscopic/Microscopic Examination	Microscopy disclosed that all pages were inkjet printed. The combination of colour inks was similar among Pages 1 to 3 and different on Page 4. Doublets of yellow inkjet drops were observed beyond the printed border on Page 4 but not on Pages 1 to 3, which did not show drop doublets. The signatures on Pages 1 to 3 were pen ink made by hand, but the signature on Page 4 was inkjet printed. No paper fiber disturbances or photocopier trashmarks were observed.
	Video Spectral Comparator (VSC)	Page 4 fluoresced more strongly under UV light, and less strongly under various spot fluorescence settings, than Pages 1 to 3. The density of Page 4 paper fibers that fluoresced under various spot settings differed significantly from Pages 1 to 3.
	ESDA	No legible handwriting impressions were observed on any of the pages.
	Transmitted Light	Page 4 was more opaque that than Pages 1 to 3.
	Magmouse	No remnant magnetism was observed among any of the pages. This was an expected result due to the absence of eletrophotographic toner.
	Visual Examination	Immediately disclosed upon opening was that Pages 1 to 3 appeared to have similar printed colours, while Page 4 was noticeably different in colour and paper weight/thickness. There were no staple holes or binding marks on any page.

TABLE 2

WebCode	Methods/Techniques	Observations
QRPR6N	Examination Information	The items listed in this Certificate of Analysis were assessed and examined based on the methodology described in the Forensic Document Unit (FDU) Test Methods (unless otherwise noted). The methodology used included macroscopic, microscopic, paper, printing process, ink, and indented impressions examinations, as well as a font classification and handwriting assessment. The laboratory request called for an examination of a four-page academic transcript for alterations.
	Macroscopic/Microscopic Examination	Paper: The documents in Pages 1-4 in Item Q1 were printed on white sheets of paper. Pages 1-3 measured approximately 8 ½" in width by 11" in length, while Page 4 measured approximately 8 ½" in width by 10 15/16" in length. Pages 1-4 in Item Q1 were assessed for paper fiber distribution with transmitted lighting and optical brightness with ultra-violet lighting. Pages 1-3 in Item Q1 reacted similarly to these alternate light sources. In contrast, when compared to Pages 1-3 in Item Q1, Page 4 in Item Q1 was denser in paper fiber distribution and more vivid in optical brightness. Additionally, when viewed under fluorescent lighting, the reactive fibers in Pages 1-3 in Item Q1 appeared similar in size and shape. However, the reactive fibers in Page 4 in Item Q1 appeared smaller in size and shape than the fluorescing fibers in Pages 1-3 in Item Q1. Print Process: Pages 1-4 in Item Q1 were printed from multi-color ink jet print process(es). However, the print process in Page 4 of Item Q1 differed in quality, clarity, color, and reaction to alternate light sources. Ink: The stylized signatures in Pages 1-3 in Item Q1 were executed with black, non-ballpoint ink, while the stylized signature in Page 4 in Item Q1 was a non-original signature, printed with a multi-color ink jet printer. The ink signatures in Pages 1-3 in Item Q1 reacted similarly under alternate light sources.
	Indented Writing	Pages 1-4 in Item Q1 were processed for indented impressions. Indented impressions are generally impressions left on a document due to having been in contact with another document during the writing process. When deciphered, indented impressions may be subject to more than one interpretation. Eight (8) electrostatic detection device (EDD) lifts, individually marked as Q1A1-Q1A8, were created from the front and reverse of Pages 1-4 in Item Q1, respectively. The EDD lifts can be viewed in Item Q1A. No unsourced indented impressions were observed on EDD lifts Q1A1-Q1A8 in Item Q1A.
	Font Classification	Using reference materials available within the FDU, a font search was conducted on the font on Pages 1-4 in Item Q1. The font on all four (4) pages were similar in size, class characteristics, and most closely correlated to "Lucida Sans Typewriter" and other similar fonts. The classification was limited due to the lack of a complete character set of the font on Pages 1-4 in Item Q1. Additionally, the text, "Degree Awarded: Bachelor of Science December 13, 2024" on Page 4 in Item Q1 contained narrow intra-word spacing. The spacing between the characters within this line was narrower than the intra-word spacing on the rest of the text on Page 4, as well as the text on Pages 1-3 in Item Q1. Therefore, this evidence suggests that the text, "Degree Awarded: Bachelor of Science December 13, 2024" may have been an insertion on Page 4 in Item Q1.

TABLE 2

WebCode	Methods/Techniques	Observations
	Handwriting Examination	Pages 1-4 in Item Q1 contained stylized signatures. The signatures in Pages 1-3 in Item Q1 were original signatures executed in black, non-ballpoint ink. The signature depicted in Page 4 in Item Q1 was a non-original signature, printed with a multi-color ink jet print process. The assessment of a non-original signature was a limitation to the handwriting assessment because features such as naturalness, line quality, and speed cannot be fully assessed. The stylized signatures in Pages 1-4 in Item Q1 are suitable for a handwriting comparison, with limitations.
	Opinion	Based on the examination of Pages 1-4 in Item Q1, the evidence suggested the four-page document had been altered by a substitution of Page 4 in Item Q1.
	Examination Remarks	Images of Pages 1-4 in Item Q1 and EDD lifts Q1A1-Q1A8 in Item Q1A will be retained by the FDU. The EDD lifts in Item Q1A will be returned to the agency.
QRQGFC	Visual Examination	A detailed analysis of the documents was carried out to identify their general characteristics (color, odor, texture, brightness, etc.), in which a significant difference in printing quality was observed. Specifically, the tonality of the background image and the letters of the legend “Center Square University” on pages 1 to 3 are lighter in tone compared to those on page 4.
	Macroscopic Examination	Microscopic analysis determined that the signatures on pages 1, 2 and 3 are handwritten, as opposed to the signature on page 4, which is printed.
	Video Spectral Comparator (VSC)	By applying infrared light, it can be seen that the watermark exhibits different behavior between pages 1 to 3 and page 4. The way the ink absorbs and reflects light is clearly different on these two groups of pages.
QTW8EE	Ruler	Page 4 of the document is shorter than the others
	Microscopic Examination	Page 4 was printed entirely in CMYK mode of an inkjet printer, pages 1, 2, 3 were printed in CMY mode, and graphic elements and alphanumeric characters appearing as black were printed only using black ink (K). Signatures on pages 1, 2 and 3 are handwritten in black ink. Signature on page 4 is an inkjet print.
	Video Spectral Comparator (VSC)	Conclusions after observing the document using VSC are the same as after examining it under a microscope. Moreover the paper on which the card with page 4 was made shows a different luminescence under UVlight compared to the other 3 cards of paper with pages 1, 2 and 3.
R7EDNK	Visual Examination	no significant observations
	Oblique Light	no significant observations
	ESDA	Indentations/ embossments were developed on the back side of pages 1, 2, and 3 in the area approximately behind the "Verified by:" line on the front of the pages.
	Video Spectral Comparator (VSC)	Utilizing infrared reflectance techniques, the entries on the "Verified by:" line on the pages 1, 2, and 3 were observed to drop out, while the entry on the "Authorized By:" line of page 4 did not. Utilizing infrared luminescence techniques, the entries on the "Verified by:" line on the pages 1, 2, and 3 were observed to fluoresce, while the entry on the "Authorized By:" line of page 4 did not. Additionally, utilizing infrared luminescence techniques, paper fibers fluoresced on all four pages, but there appeared to be more fluorescing on page 4.

TABLE 2

WebCode	Methods/Techniques	Observations
R96FRN	Video Spectral Comparator (VSC)	- Page 4 paper is more UV reactive than pages 1 through 3. Pages 1 through 3 have similar UV reactivity. - Page 4 machine printing ink and paper have different optical properties under IR spot than pages 1 through 3. Pages 1 through 3 have similar reactivity. - Inked signatures on pages 1 through 3 have similar reactivity under IR spot.
	Macroscopic/Microscopic Examination	pages 1 through 4 are 4-color inkjet printed. - pages 1 through 3 are similar in ink density, coloring, and crispness - page 4 has different ink density, coloring, and crispness compared to pages 1 through 3. Pages 1 through 3 have inked signatures while page 4 signature is 4-color inkjet printed.
	ESDA	No indented impressions noted on any of the 4 pages.
RBTRTE	Video Spectral Comparator (VSC)	Different radiation was observed on page 4 of the transcript against radiation at different wavelengths.
	Microscopic Examination	There were differences in the color tone of the text and emblem on page 4 of the transcript compared to the color tone of the text and letters on the other pages.
	Visual Examination	It was observed that the font size of the text on page 4 of the transcript was different from the font size of the text on the other pages.
RDZAPP	Visual Examination	Visually, pages 1, 2, and 3 all appear similar with the same heading on all pages and a light grey background text which repeats 'CENTER SQUARE UNIVERSITY - ' all throughout the background. Page 4 appears visually lighter than the other 3 pages, with the grey repeated text remarkably lighter than on the first 3 pages. The printed material on page 4 also appears blurrier than that present on pages 1, 2, and 3. Red, white and grey logo on page 4 is not as detailed as present on pages 1, 2, and 3. 'Verified by' signatures on pages 1, 2, and 3 all contain a stylized signature as 1 name, starting with an "S". 'Authorized by' signature on page 4 is a stylized signature with 2 names, first name starting with an "S" and second name starting with an "O". No known document submitted for verification purposes, so unsure if this difference is significant.
	Oblique Light	No impressions or indentations noted on pages 1, 2, 3, and 4.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Infrared filters: - On pages 1, 2, and 3 - Logo drops out, except for the image of the book, around 645nm - Page 4 logo still visible at 645nm - On pages 1, 2, and 3 - Background printing text drops out around 715nm - Still present on page 4 until around 780nm - On pages 1, 2, and 3 - Signature drops out around 780nm - Page 4 signature does not drop out, even at 1000nm - On pages 1, 2, and 3 - Border drops out around 850nm - Page 2 border does not drop out, even at 1000nm IR Luminescence (Spot Light) - Ink signature not found to fluoresce on all pages (1, 2, 3, and 4) - On pages 1, 2, and 3 - some bright fibers noted in paper using orange and dark orange colored filters - Page 4 has many more colored fibers and particles present in orange and dark orange filters and under blue and blue green filters Ultraviolet Light - Page 4 appears brighter under UV light (365nm and 254nm) than pages 1, 2, and 3 - Under UV 254nm, On page 4, can see the light grey areas of the logo, but these areas not present on pages 1, 2, and 3 Transmitted Light Pages 1, 2, and 3 overlay nicely when looking at page number and border when corners of pages are aligned. Page 4 does not overlay with page 1 - border and page number are slightly misaligned when page corners are aligned; College name, 'Official Transcript', Date of birth, and border misaligned at top when page corners are aligned Above all suggest that page 4 was probably not printed in the same way as the other pages.
RHV3MQ	Video Spectral Comparator (VSC)	(VSC). When exposing the four (4) pages of the document, given the benefits offered by the integrated work station VSC6000, with lights at different intensities, in different wavelengths and amplitudes, color filters, among others, it is found that the last page (pg. 4) has a different spectral response compared to the three (3) previous pages, where both the paper and the printing and the ink that traces the signature, on page 4, differ from pages 1, 2 and 3.
RJ67DV	ESDA	No indented writing observed.
	Oblique Light	No indented writing observed.
	Microscopic Examination	Inkjet printing process on Item 1 (Q1), pages 1 through 3 with original inked signatures. Page 4 is inkjet in its entirety (including the signature). The printing on page 4 exhibits different print quality than on pages 1 through 3
	Ruler	Item 1 (Q1) page 2: Inconsistent relative alignment/spacing observed on "Summer 2022" and "Fall 2023" sections.
	Visual Examination	"Fall 2023" appears on on pages 2 and 3 of Item 1 (Q1). Signatures on pages 1 through 3 are limited in quantity/complexity.
	Video Spectral Comparator (VSC)	The paper on page 4 of Item 1 (Q1) exhibits different reflective properties than on pages 1 through 3 using UV and spot lighting with filters.
	Transmitted Light	No watermarks observed.

TABLE 2

WebCode	Methods/Techniques	Observations
RQP7T9	Video Spectral Comparator (VSC)	1. The colour printing on the Page 1 is similar with the colour printing from Page 2 and Page 3. 2. The colour printing on the Page 4 is different from the colour printing in Page 1, Page 2 and Page 3. 3. Under the infrared luminescence light, Page 1 is similar with the Page 2 and Page 3. 4. Under the infrared luminescence light, Page 4 is different from the Page 1, Page 2 and Page 3. 5. The signatures on the Page 1, Page 2 and Page 3 were handwritten. 6. The signature on the Page 4 was printed. Under the microscopic examination, the image of this signature showed similarities characteristic as ink jet printing process. 7. The signature on the Page 4 was different in structure from the signatures on the Page 1, Page 2 and Page 3. 8. The text background colour printing on the Page 1 is similar with the colour printing from Page 2 and Page 3. 9. The text background colour printing on the Page 4 is different from the colour printing in Page 1, Page 2 and Page 3. 10. Under UV lighting, Page 4 exhibited different characteristics from Page 1, Page 2 and Page 3. 11. Page 4 exhibited different printing characteristics compared to Page 1, Page 2 and Page 3.
	ESDA	1. No indented impressions were found on the Page 1, Page 2 and page 3. 2. Impressions was found on the Page 4 that consists of a CENTRE SQUARE UNIVERSITY Logo, words “CENTRE SQUARE UNIVERSITY”, “Centerlande, Ohio” and “OFFICIAL TRANSCRIPT”.
RU89ZD	Visual Examination	• Preprinted format on letter size paper filled out on electronic means. • The page dimensions are larger on the first three pages compared with the fourth page. • There is a difference on the printing tone on the central image of the document on page 4 compared with the first three pages. • There is a lower printing tone on the words “CENTER SQUARE UNIVERSITY” on page four.
	Microscopic Examination	• Jagged edges on the first three pages, and flat on the fourth page. • The four pages where printed on an ink injection system. • The fourth page shows a saturation of points on its cross-hatching. • The typographic elements of the fourth page show the following differences compared with the first three pages: - More thickness - Yellow ring on the edges
	Video Spectral Comparator (VSC)	• The signatures of the first pages show the following characteristics: - Ridges on the strokes as a result of the muscular pressure that the scribe makes on the paper with the writing tool. (Raking light) - Brightness on the strokes, meaning, remains of oily elements of the ink. (Oblique light) - The type of start or end of strokes are clearly defined. - There is no distortion on the design of characters due to the flexible nature of a printing matrix. - Shows fine lines. • The signatures of the fourth page show the following characteristics: - Lack of ridges on the strokes. (Transmitted light) - The edges of the strokes are irregular due to the absorption of the ink on the paper (Oblique ligh. - There is opacity on the strokes as a result of the characteristic elements od liquid inks for digital printing. (Oblique ligh. - The type of star or end of strokes are observed as overlapped. - Satellites on the edges of the strokes. • Infrared light: when the document is subject to infrared light, it can be observed ink vanishing on the signatures. Except for the signatures that appear on page four.
RZBA28	ESDA	1. ESDA examination on pages 1, 2 and 3 only revealed the image of logo on the respective pages. 2. ESDA examination on page 4 revealed the printed entries, signature and image of logo on the page itself.

TABLE 2

WebCode	Methods/Techniques	Observations
	Visual Examination	1. It was observed that the colour of the logo "Center Square University" on page 4 to be darker than the colour of the logo "Center Square University on pages 1, 2 and 3. 2. The signatures on pages 1, 2 and 3 were different in structure from the signature on page 4.
	Video Spectral Comparator (VSC)	1. The paper of page 4 showed different UV characteristics from the paper of pages 1, 2 and 3. The paper of page 4 fluoresce under the UV light. 2. The signatures on pages 1, 2 and 3 were handwritten. However, the signature on page 4 was not handwritten but instead was a printed signature consistent with being printed using ink jet printing process. 3. The images of the background design, logo and printed entries on pages 1 to 4 showed similar printing process characteristics as ink jet printing process. Hence, I am of the opinion that the background design, logo and printed entries on pages 1 to 4 were printed using an ink jet printing process. 4. The images of the background design, logo and printed entries on page 4 showed different printing characteristics from the images of the background design, logo and printed entries respectively on pages 1, 2 and 3. Hence, I am of the opinion that the page 4 was printed from a different printer from the pages 1, 2 and 3.
T3ZZLC	Visual Examination	1.-In page 1, 2 and 3, the letterhead is centered and defined unlike in page 4 where it is centered, but much darker. 2.-On pages 1, 2 and 3, the filling text is defined and outlined, as opposed to page 4 where it is defined, but with a higher concentration of “black” ink. 3.- Regarding the logo in the background, on pages 1, 2 and 3, the logo is slightly opaque, with defined lines and a gray tone in the book, unlike page 4, where the orange color is more intense and the lines of the book are darker: 4.- Moreover, the security background with legend CENTER SQUARE UNIVERSITY has a gray tone, simple spacing and is continuous non-random, and on page 4, CENTER SQUARE UNIVERSITY, has a more faded gray tone, simple spacing and is continuous and non-random. 5.- The signature found on pages 1, 2 and 3, is original, unlike the page where it is not original, and instead we find a digital reproduction.
	Microscopic Examination	Microscopic examination: 6.-In the microscopic examination of the printing system, differences are observed in pages 1, 2, 3 and 4. 7.- A higher concentration of ink is observed in the filling text of page 4 in relation to the text contained in pages 1, 2 and 3 in the microscopic examination. 8.- In the microscopic examination of the signature, the same printing system used in the filling text and format of the same page 4 is confirmed, which differs from the printing characteristics of the signature in pages 1, 2 and 3.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Examination carried out under different light sources. 9.-White light: no significant changes are observed in the support material or printing systems for pages 1, 2, 3 and 4. 10.-Transmitted light: the security background is blurred and completely eliminated in some areas of page 4, as opposed to pages 1, 2 and 3 where the background is still slightly visible. 11.-Transmitted light, the alignment of the letterhead, margin line and page numbers were compared regarding the edges of the sheet of paper, with the following results: - Between page 1 and 2: aligned. - Between page 1 and 3: aligned. - Between page 1 and 4: notably misaligned, 12.-Raking light (left and right): no line (low relief) was observed in the signature ridges strokes on page 4, unlike the signatures on pages 1, 2 and 3. 13.- Ultraviolet light (U.V.): No significant changes were observed, a uniform brightness of the support material was maintained, no stains or traces of fluids or any other agent were observed on pages 1, 2, 3 and 4. 14.- Through the application of infrared light (IR): - The filling text remains on pages 1, 2, 3 and 4. - The background coat of arms disappears on pages 1, 2, 3 and 4. - The signature on page 4 remains unlike the signature on pages 1, 2 and 3 where it disappears.
TEDXT2	Microscopic Examination	There are different print processes between Pages 1-3 and Page 4. The signatures on Pages 1-3 are written-ink-on-paper, while Page 4 is printed.
	Contextual Examination	On Page 2, Summer 2022, the semester GPA is inconsistent with the listed grades. The listed grades would compute to a 2.41 GPA, not a 2.07. No other semester calculates to an incorrect GPA. Furthermore, the listed grades would compute to a 2.736 GPA overall for the student, not a 2.70.
	Ultraviolet Light	UV dull streaks noted on the back of Pages 1 and 2.
	ESDA	Previously mentioned UV dull streaks noted in ESDA lifts of Pages 1 and 2.
TFJNTP	Visual Examination	Visual examination of Exhibits Q1(1)(a and b) through Q1(4)(a and b) was conducted.
	Microscopic Examination	Microscopic examination of Exhibits Q1(1)a through Q1(4)a was conducted. The questioned machine-generated text entries on Exhibits Q1(1)a through Q1(4)a were prepared using liquid inkjet printing technology. The questioned signature on Exhibit Q1(4)a was prepared using liquid inkjet printing technology. The questioned signatures on Exhibits Q1(1)a through Q1(3)a were prepared using black non-ball point ink. The inks on Exhibits Q1(1)a through Q1(3)a were not distinguishable at this non-destructive level of analysis. If chemical analysis of the inks is requested, the evidence should be sent to a laboratory that conducts destructive ink examinations
	Indented Writing	Electrostatic Detection Apparatus (ESDA) examination of Exhibits Q1(1)(a and b) through Q1(4)(a and b) was conducted. The following was observed: Indented handwriting impressions were observed on Exhibits Q1(1)b, Q1(2)b, and Q1(3)b, however, these indented impressions are not of evidentiary value. Indented machine-created impressions were observed on Exhibits Q1(1)(a and b) through Q1(4)(a and b). No further indented impressions were observed on Exhibits Q1(1)a, Q1(2)a, Q1(3)a, and Q1(4)(a and b). Indentation lifts were created to preserve the results of the ESDA examination
TRGLHB	Video Spectral Comparator (VSC)	After VSC examination,the School badge IR luminescence of page 4 is different from page 1to 3. The signature on page 4 was written with a pen, while pages 1 to 3 were inkjet printed.

TABLE 2

WebCode	Methods/Techniques	Observations
	Macroscopic/Microscopic Examination	The text on page 4 is pure black, while other colored inkjet can be seen on pages 1 to 3.
TRYFJK	ESDA	Processed for indented writing and looking at potential roller marks.
	Video Spectral Comparator (VSC)	UV paper comparison, looked for any CPS codes, IR exam
	Macroscopic/Microscopic Examination	Looked at inkjet and original/non original signatures.
TWWWXY	Video Spectral Comparator (VSC)	Pictorially page 4 appears to be different from pages 1 to 3 The inkjet printing on page 4 differs from the inkjet printing on pages 1 to 3 Signature ink on page 4 reacts differently when compared with signature inks on pages 1 to 3 under Infrared light There are similarities in inkjet printing on pages 1 to 3 Signature inks on pages 1 to 3 reacts the same under Infrared light
	ESDA	No indentations were observed on the academic transcript marked Q1
TYW63A	Visual Examination	Visual examination of all four pages of the questioned document (QD). Noted: Pages 1 - 4 of the QD contains a perceptible and repetitive watermark "Center Square University" which appears throughout the body of the QD. Pages 1 - 4 of the QD has an enclosed rectangle border around the main body of the document. Each page 1 - 4 of the QD is verified/authorized signed by a signature.
	Macroscopic/Microscopic Examination	Examination of QD pages 1-4 with a digital microscope. Noted: The repetitive watermark on page 4 is of a slightly different colored ink that is employed on the repetitive watermark on pages 1-3. The enclosed rectangle border around the main body of the QD on page 4 is not consistent with the size of the border utilized in pages 1-3. The "Authorized By"signature displayed on page 4 of the QD is printed with a laser printer, and was not signed as a wet-inked signature as seen in pages 1-3 of the QD. In addition, the font on page 4 of the QD is thicker than the font on pages 1-3. The maroon font color used for the letterhead portion of page 4 of the QD ("Center Square University Centerline, Ohio) contains more black when compared with the lighter maroon colored font used on pages 1-3. The center university seal in the middle of page 4 is of a different color (peach and gray) than was used on pages 1-3 of the QD.
	Touch	Noted: I rubbed my fingers on the back of pages 1-4 of the QD where the signatures appear on the front of the QD. I could feel indentations/pressure pattern of writing of the signatures on pages 1-3, but there were no noticeable indentations/pressure patterns behind the signature located on page 4 (because the "Authorized By" signature is printed with a printer).
TZRN4B	Ultraviolet Light	Document No. 1 (academic transcript) consists of four A4 pages. Under ultraviolet light inspection, it was found that the fluorescence reaction of PAGE4 paper is different from that of PAGE1, PAGE2, and PAGE3 papers, indicating that PAGE4 paper does not come from the same source as PAGE1, PAGE2, and PAGE3 papers
	Infrared Light	Using infrared light to inspect PAGE1 to PAGE4, a total of four A4 pages, it was found that there were no significant differences in the printed ink text. However, the infrared absorption spectrum of the signature on PAGE4 paper is significantly different from the signatures on PAGE1, PAGE2, and PAGE3 papers, indicating that the signature on PAGE4 document does not come from the same source as the signatures on PAGE1, PAGE2, and PAGE3 papers

TABLE 2

WebCode	Methods/Techniques	Observations
	Macroscopic/Microscopic Examination	Under the same magnification, inspecting PAGE1 to PAGE4, a total of four documents, all printed with color toner, it was found that the color background and text of PAGE4 document are significantly more blurred. The color background of PAGE1, PAGE2, and PAGE3 documents clearly shows blue and red toner particles, indicating that PAGE4 document printing does not come from the same source as PAGE1, PAGE2, and PAGE3
U3DU2D	Video Spectral Comparator (VSC)	With the help of the spectral comparator video, the questioned document is inspected, which reveals discrepancies in the general printing aspects of the document, as well as in the chromatic tones of page 4 with respect to the other pages 1, 2 and 3 of the questioned document. In addition, when the document in question is subjected to infrared light of 780 nanometers, different reactions are also observed in the ink used to print the document (background texts and background image) and the signature on page 4 with respect to pages 1, 2 and 3 respectively.
U8DY6B	Macroscopic/Microscopic Examination	The ink distribution and color of the printed patterns and words on page4 are different from those on page1 to page3. The signatures on page1 to page3 were written by black ink pen, but the signature on page4 was printed by color inkjet printer.
	Video Spectral Comparator (VSC)	The spectral characteristics of paper on page 4 are different from those on page1 to page3.
	Overlays	The layout of page4 does not match with page1 to page3,it shows that the overlapped image of page4 and page1 to page3 has a little misplacement, respectively.
	Raman Spectroscopy	The Raman spectrum of magenta, yellow, cyan and black ink dots on page4 are different from those on page1 to page3 at 785nm respectively. And the spectrum of the same color ink dots on page1 to page3 are not significantly different.
U8PXPU	Visual Examination	-The university logo on page 4 appears in a darker shade than the logos on pages 1 to 3. -The text appearing in the background of page 4 is in a lighter shade than that on pages 1 to 3 -The paper on page 4 is whiter than that on pages 1 to 3. -The paper on page 4 is shorter than that on pages 1 to 3. -The text on page 4 is not as sharp as the text on pages 1 to 3. -The phrase “Authorized By:” on page 4 contains a capital “B” in “By”, which should be in lowercase. Additionally, the font size is smaller than that used in the phrase “Verified by:” on pages 1 to 3. -The signature line on page 4 is aligned horizontally with the phrase “Authorized By:”, while the signature lines on pages 1 to 3 are positioned lower than the phrase “Verified by:”
	Video Spectral Comparator (VSC)	-The paper on page 4 shows different UV fluorescence from pages 1 to 3. -The signature on pages 1 to 3 shows consistent handwritten indentation from pen pressure, whereas no such handwritten indentation is found on page 4.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	-Although all four pages were printed using an inkjet process, page 4 was not printed by the same printer as pages 1 to 3. This can be clearly observed under magnification of the black printed text on pages 1 to 3, where the ink seeps into the paper fibers and no multicolored ink dots are scattered around the characters. In contrast, while the ink on page 4 also penetrates the paper fibers, multicolored ink dots are visibly scattered around the printed characters. -On page 4, scattered ink dots appear around the signature strokes, while those on pages 1 to 3 have smooth edges and do not show any ink dots. -The edges of page 4 contain numerous paper fibers and appear rougher compared to the smoother edges of pages 1 to 3. -The paper on page 4 is approximately 0.6–0.8 mm shorter than that on pages 1 to 3.
UAQZFV	Microscopic Examination	The signature in the section "Authorized by" on the fourth page of the questioned document is not made with the writing tool (pen, pencil, etc.), it is printed.
	Video Spectral Comparator (VSC)	4th page (sheet of paper) of the questioned document reacts differently under various light sources than 1st, 2nd and 3rd pages (sheets of paper).
UE89YN	ESDA	2. Laboratory item #1, Invoice #Q201202 was examined utilizing oblique/side lighting and EDD (Electrostatic Detection Device) for the possible presence of indented impressions. Aside from the laboratory number, lab item number, envelope outline, paper outline, or extraneous markings - no indented impressions were found on Q1. However, impressions of the printed material including the logo were found on Q1 page 4, which were different than the ones on Q1 pages 1 through 3. See report pages 7 and 8 as a representation of the impressions found.
	Video Spectral Comparator (VSC)	Visual, microscopic and VSC (Video Spectral Comparator) examination of Laboratory item #1 (Q1), revealed the following: a. While all four pages of Q1 are produced utilizing a color inkjet process, differences were found to exist between the printed material on pages 1 through 3 when compared to page 4, including differences of yellow half tone density, degree of smoothness in the font, and differences in optical properties of the inks. See pages 3 through 6 of this report as a representation of the inconsistencies found.
	Ultraviolet Light	1. Visual, microscopic and VSC (Video Spectral Comparator) examination of Laboratory item #1 (Q1), revealed the following: a. While all four pages of Q1 are produced utilizing a color inkjet process, differences were found to exist between the printed material on pages 1 through 3 when compared to page 4, including differences of yellow half tone density, degree of smoothness in the font, and differences in optical properties of the inks. See pages 3 through 6 of this report as a representation of the inconsistencies found. b. The signature present on Q1 page 4 is a reproduced inkjet-printed signature and not a wet ink, original signature. In comparison, the three signatures present on Q1 pages 1 through 3 are original, wet ink signatures. c.Differences were found to exist between the paper substrate of Q1 pages 1 through 3 when compared to Q1 page 4 with regards to their Ultra-Violet fluorescence. Q1 page 4, exhibited a bright fluorescence response compared to Q1 page 1 through page 3, which exhibited a dull response when examined under short and long UV wavelength.

TABLE 2

WebCode	Methods/Techniques	Observations
	Microscopic Examination	The signature present on Q1 page 4 is a reproduced inkjet-printed signature and not a wet ink, original signature. In comparison, the three signatures present on Q1 pages 1 through 3 are original, wet ink signatures.
UFH8VJ	Oblique Light	No significant findings observed.
	ESDA	Indentations/embossments were developed on the back side of pages. 1, 2, 3. Indentations were developed on the front side of page 4.
	Video Spectral Comparator (VSC)	Using an infrared flood light, ink of signature dropped out on pages 1, 2, 3 when 1000 nm filter was applied. Paper fibers fluoresced on pages 1, 2, 3, 4 with Violet through Far Red spot lights. Signatures fluoresced on pages 1, 2, 3 under all spot light colors except for the Amber color spot light. The signature on page 4 had no fluorescence that was observed. Paper fibers on page 4 seemed more numerous than on pages 1, 2, 3.
UH6R2M	Microscopic Examination	The structure of the prints on page 4 of item Q1 is different from the prints on pages 1-3 of item Q1. For example, the black prints on page 4 are a mixture of black, magenta, blue and yellow inkjet inks. Whereas the black prints on pages 1-3 are made using only black inkjet ink. Which indicates that page 4 was made with a different inkjet printer than pages 1-3 of item Q1. The signature on page 4 was printed. The signatures on pages 1-3 were handwritten.
	Video Spectral Comparator (VSC)	The optical properties (UV and IR luminescence) of the page 4 paper are different from the optical properties of the page 1-3 paper. Yellow, magenta and blue inkjet inks on the pages 1-3 have different optical properties (IR luminescence, IR absorption) than the inkjet inks of these colours on the page 4 of the item Q1.
UKWLZC	Visual Examination	A visual inspection is carried out where it is evident that the fourth folio has a different color in the shield.
	Magnification	It can be seen that the characters on the fourth folio are thicker than those on the remaining folios.
	Video Spectral Comparator (VSC)	It can be seen that the fourth folio has a different type of printing than the other folios. A different reaction to infrared light can be seen on the fourth folio compared to the other folios. The ink in which the signature is found also varies between the fourth folio and the other folios.
UW3YVH	Visual Examination	No significant observations.
	Oblique Light	No significant observations.
	Video Spectral Comparator (VSC)	On pages 1, 2, and 3, inks in the signature area appeared lighter and inks along the border of the transcript dropped out when utilizing an infrared flood light with camera filters ranging from 570nm to 1000nm. On pages 1, 2, and 3, inks in the signature area and paper fibers fluoresced when screening for IR luminescence with camera filters ranging from 570nm to 1000nm under color filters from the visible spectrum of violet to far red, excluding amber. On page 4, there were no significant observations when utilizing an infrared flood light with camera filters ranging from 570nm to 1000nm. On page 4, paper fibers fluoresced when screening for IR luminescence with camera filters ranging from 570nm to 1000nm under color filters from the visible spectrum of violet to far red.
	ESDA	Indentations/embossments observed in ESDA lifts generated from the back of pages 1 through 4.

TABLE 2

WebCode	Methods/Techniques	Observations
UW4N78	Visual Examination	It is observed that pages 1, 2, and 3 of Q1 show a color difference with page 4.
	Microscopic Examination	It is observed that pages 1, 2, and 3 of Q1 show a different printing system used that the one in page 4. In addition, the signature on pages 1, 2, and 3 has been made by ballpoint ink, while the signature on page 4 has been printed.
	Video Spectral Comparator (VSC)	780nm IR light: It is observed that the signature shows transmittance (it disappears) on the front of pages 1, 2, and 3 of Q1. 780nm IR oblique light: A groove is observed in the signature on the front of pages 1, 2, and 3 of Q1. White oblique light: Relief is observed in the signature on the back of pages 1, 2, and 3 of Q1.
UXHXE8	Visual Examination	Observation in transmitted light showed that paper of the 4th page has a different lumen than papers of 1-3 pages. The pages 1-3 has the same dimensions and page 4 is the is a little lower and wider.
	Ruler	The pages 1-3 hve the same dimensions about 215×279mm, page 4 is a little lower and wider (about 216×278 mm).
	Microscopic Examination	The graphic designs of all four pages are printed by the ink-jet technique in color mode, but quality of printings on 4th page is much more lower. The fillings of pages 1-3, except of illegible signatures, are printed by the ink-jet technique in monochrome (black) mode. The signatures on pages 1-3 are handwritten by black ink or black inks. On pages 1-4 there are satellites of black ink visible outside the main prints. The fillings of page 4, including the signature, are printed by the ink-jet technique in color mode.
	Video Spectral Comparator (VSC)	The pages 1-3 has the same dimensions and page 4 is the is a little lower and wider. The graphic designs of all four pages are printed by the ink-jet technique in color mode, but quality of printings on 4th page is much more lower. The fillings of pages 1-3, except of illegible signatures, are printed by the ink-jet technique in monochrome (black) mode. The signatures on pages 1-3 are handwritten by black ink or black inks with compatible optical properties. The fillings of page 4, including the signature, are printed by the ink-jet technique in color mode. Observation in VIS, UV, IR showed that papers od 1-3 pages have different optical properties than paper of the 4th page. Observation in transmitted light showed that paper of 4th page has a different lumen than papers of 1-3 pages.
	Analitycal scale	The papers of all 4 pages have similar weight about 4,7 g.
	ESDA	No traces of indentations were found.
V6CPZ7	Visual Examination	The fourth sheet of paper is a different colour to the first three.
	Microscopic Examination	The text and background of all four sheets are printed by an inkjet printer. The distribution and colour of the dots on the fourth sheet is different from the distribution and colour on the first three sheets. The signatures on the first three pages are the original entries in black ink. The signature on the fourth page is a reproduction of the signature printed on an inkjet printer.
	Transmitted Light	There are no differences between the first three sheets, but there are differences from the fourth sheet.
	Ultraviolet Light	There are no differences between the first three sheets, but there are differences from the fourth sheet. The fluorescence of the fourth sheet is brighter.

TABLE 2

WebCode	Methods/Techniques	Observations
	Infrared Light	There are no differences between the first three sheets, but there are differences from the fourth sheet. At 780nm, the background disappears on the first three sheets, but not on the fourth.
	Video Spectral Comparator (VSC)	There are no differences in the IR luminescence between the first three sheets, but the fourth sheet fluoresces differently under the same conditions.
VD9KVJ	Macroscopic/Microscopic Examination	The signatures on pages 1 through 3 are original ink. The signature on page 4 is machine printed. The text on pages 1 through 3 is mono color inkjet. The text on page 4 is 4 color toner. The logo on pages 1 through 3 is a different color than the logo on page 4.
	Ultraviolet Light	Page 4 is more optically bright than pages 1 through 3.
	Infrared Light	The logo on pages 1 through 3 disappears under IR, but the logo on page 4 remains visible. Different ink combination.
	Infrared luminescence	Page 4 has a greater density of recycled fibers than pages 1 through 3.
	ESDA	No results of value.
VJX3CF	Macroscopic/Microscopic Examination	The substrate of all 4 pages of the transcript appears to be plain copy paper, with no overt security features. The colour of pages 1 - 3 of the transcript is a similar creamy white compared to the purer white of page 4 (based on naked eye). The print process for all pages of the transcript is ink jet, however, the appearance of the print in all areas (including background, logo, university name and personalisation) is similar for pages 1 - 3 of the transcript, and different on page 4.
	Ruler	The size of each of the 4 pages of the transcript is US letter (approx 279 x 216mm, measured with a non-calibrated ruler). The spacing between the edge of the page and the printed box is similar on pages 1 - 3 of the transcript and slightly different on page 4.
	Transmitted Light	The look-through appearance of pages 1 - 3 of the transcript is similarly mottled, while of page 4 is also mottled but slightly darker than pages 1 - 3.
	Ultraviolet Light	Pages 1 - 3 of the transcript are darker under UV-A, B and C (and similar to each other) compared to page 4.
	Spectral examination	The spectral properties of the printed logo on pages 1 - 3 of the transcript are similar, but different compared to page 4.
	Overlays	The layout (placement), font and logo design of the printed content of the transcript is similar on all pages, with the exception of the printed border (slightly smaller/higher bottom line) and page number (slightly higher) on page 4 compared to pages 1 - 3.
	ESDA	(also via macroscopic examination) The signatures on page 1 - 3 of the transcript are written in black ballpoint pen ink while the signature on page 4 is ink jet printed.
VLJLGK	Macroscopic/Microscopic Examination	Determined printing processes used. Items 1.1, 1.2 and 1.3 produced using color inkjet technology. Item 1.4 produced by laser technology. Determined signatures on Items 1.1, 1.2 and 1.3 were original inked signatures. Item 1.4 the signature is toner.
	ESDA	Items 1.1, 1.2, 1.3 and 1.4 were processed using the ESDA. No indented impressions were recovered.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	Items 1.1, 1.2, 1.3 and 1.4 were examined on the VSC-8000. Difference in reflectance were noted between Items 1.1, 1.2, 1.3 which were all the same and Item 1.4 which was different. Also, differences in the ink were noted as Item 1.1, 1.2 and 1.3 contain original inked signatures and the Item 1.4 signature is toner. There were also differences in the luminescences of the fibers in the paper. Items 1.1, 1.2 and 1.3 were all the same, whereas, Item 1.4 was different.
VME6JL	Indented Writing	The questioned documents, Items Q1.1, were examined for the presence of any indented writing, typing, or other identifying impressions using oblique lighting and the ESDA. No meaningful impressions were recovered in the questioned documents.
	Macroscopic/Microscopic Examination	Items Q1.1-Q1.4 were examined both visually and microscopically. These examinations revealed that the machine printing on the questioned pages was produced using an ink jet printing process. However, it was observed that the machine printing on Q1.1-Q1.3 (pages 1 through 3) appeared sharper/more distinct than the machine printing on Q1.4 (page 4).
	Overlays	The alignment of the machine printing on Items Q1.1 through Q1.4 was examined using digital imagining techniques. The four pages were digitally overlaid, along with a digital image grid, to examine the font, horizontal and vertical alignment, and spacing of the text within each page and between pages. These examinations revealed that overall, the spacing, margin and baseline usage of the printed text appears to be in expected alignment within each page and also between pages. In addition, similar sans-serif and serif fonts were used to produce the printed text on all four pages.
	Video Spectral Comparator (VSC)	Various microscopic, infrared, and ultraviolet examinations were performed on the questioned documents. These examinations revealed the following: The questioned sheets of paper, Items Q1.1-Q1.4, were examined with no visible watermarks observed. Items Q1.1 (page 1) through Item Q1.3 (page 3) exhibit similar class characteristics, such as size, color, and response to ultraviolet and infrared light sources indicating they may share a common source. However, it should be noted that paper of this type is produced in mass quantity and is available to the average consumer and should not be construed as a definitive identification. Item Q1.4 (page 4) and Items Q1.1 through Q1.3 (pages 1 through 3) disagree in class characteristics, such as color (hues), and their response to transmitted, ultraviolet and infrared light sources. Therefore, it is my opinion that Item Q1.4 was printed on different paper than Items Q1.1-Q1.3.
VMY743	Visual Examination	Visual differences in color
	Video Spectral Comparator (VSC)	Ultraviolet revealed differences in luminescence. Long pass, spot filters revealed differences in color of printed text, background, borders and page numbering. Also confirmed that the signature on page 4 was not original ink. Magnification revealed differences in print process.

TABLE 2

WebCode	Methods/Techniques	Observations
VQXGY3	Video Spectral Comparator (VSC)	Using the VSC 8000 I observed that all four pages contained no watermark. I also observed that page 4 fluoresces brighter than pages 1,2 and 3. The reverse sides of pages 1,2 and 3 have grey or white marks on them possible resulting from the machine which printed them. None were observed on page 4. Under the 715nm setting on the VSC 8000, the "Center Square University seal "drops out" and is no longer visible on pages 1,2 and 3. The seal remains visible on page 4 under that same setting. Using the VSC 8000 as well as the stereo microscope the printing process used were examined and compared. The printing process used to produce pages 1,2 and 3 is the same (inkjet). Page 4 seems to be much fainter in color and the seal appears to be a different color and has a flatter appearance. The printing process is also inkjet. The signatures on pages 1 through 4 were examined using the VSC 8000. As also observed with the microscopic examination, it was determined that the signatures on pages 1 through 3 are original and the signature on page 4 is not.
	Macroscopic/Microscopic Examination	Using the stereo microscope and lighting no visible signs of paper disturbance, obliteration or erasure was found on any of the 4 pages. The paper fibers are all intact. The color of the seals on pages 1 through 3 are consistent - an orangish-red color. The seal on page 4 contains a different color - a brighter orange. There is an inconsistency between the signatures on pages 1 through 3 compared with the signature on page 4. Signatures on pages 1 through 3 are original. The signature on page 4 is not.
	Visual Examination	There is a long vertical line on pages 2 and 3 and a medium length vertical line on page 1. Page 4 has a shorter vertical line and a half-line of asterisks (***) underneath. There is an inconsistency between the signatures on pages 1 through 3 compared with the signature on page 4. Signatures on pages 1 through 3 are original. The signature on page 4 is not. The signatures on pages 1 through 3 look like one name with a dot above the ending movement. It looks like “Sr.” It is preceded by the printed phrase “Verified by”. The signature is located on the right side of the page after the vertical line. The signature on page 4 is preceded by a different phrase, “Authorized By” and the signature looks like two words “Sr. Orr.” The location is also in a different spot. It is in the bottom center of the page. There is not enough information in the signatures to conduct a meaningful handwriting comparison. The signatures are limited due to their brevity and stylized nature.
	Thickness	Measured all 4 sheets of paper using the micrometer. I measured in various spots over each page. Each time the sleeve read .010mm and the thimble read.10. That would make the paper approximately .110mm in thickness, showing no measurement difference between sheets of paper.
	Indented Writing	Using the ESDA2 instrument, I examined the fronts and backs of Exhibit 001-001. The functionality of the ESDA2 was verified using a verification test strip each time an item of evidence was processed. Both the front and the back sides were run once on the ESDA2. No evidence of indented impressions was found. Pages 1and 4 had random stray marks that did not seem to be of significance. Using the ESDA2 instrument, I completed a second examination of the fronts and backs of Exhibit 001-001.The functionality of the ESDA2 was verified using a verification test strip each time an item of evidence was processed. Both the front and the back sides were run on the ESDA2. No evidence of indented impressions was found on the second run.
VXVA8W	Microscopic Examination	Page 1, 2 and 3 was produced using a similar background printing (inkjet), and page 4 was produced using a different background printing (copy).

TABLE 2

WebCode	Methods/Techniques	Observations
	Infrared Light	Page1,2 and 3 has Infra-red (IR) absorption ink, which appear normal in the visible region of the spectrum but then disappear when viewed in the infra-red region of the spectrum and page 4 have no Infra-red (IR) absorption ink.
	Visual Examination	The text in page 1, 2 and 3 was printed by using similar fonts, style and size as compared to page 4 which was printed with a different fonts, style and size.
	Ultraviolet Light	Page 1, 2 and 3 fluorescence the same when placed under UV light and page 4 fluoresces brightly when placed under UV light.
VZLBBY	Visual Examination	Physical appearance of writings in the background on page 4 is different from other remaining pages. In addition, the color of the paper paged 1, 2 and 3 is different from the color of page number 4. Moreover, the paper material for pages 1, 2 and 3 is different from page number 4, when you touch them.
	Microscopic Examination	Magnification with stereo microscope shows that the used printing toner on page number 4 is different from the used printing toner on pages 1, 2 and 3.
	Video Spectral Comparator (VSC)	Under infrared light a difference was noted on page number 4; whereby, page number 4 reflects differently compared to pages 1, 2 and 3. In addition, under visible flood light, the logo and writing in the background on pages 1, 2 and 3 disappear, while, on page number 4 they remain.
W2X6V7	ESDA	The file was analyzed according to the established method for the examination of revealed grooves, with the purpose of locating any writing marks, without obtaining any result. The analysis was made with the naked eye, later with the use of the equipment.
	Video Spectral Comparator (VSC)	The academic file received was analyzed according to the three stages of analysis of the applied method. First, it was studied with the naked eye, then with the use of specialized equipment to magnify the details present and finally a comparison was made of what was observed.
WBHJRG	Oblique Light	The signatures on Q1a, Q1b, and Q1c are indented into the front of the page and show embossing on the back side of the page. This is evidence that the signatures were written with a writing instrument. The signature on Q1d shows no indention into the front side and no embossing on the back side. Embossing is not expected to occur from a non-impact printing process such as an inkjet printer. Images will be captured with the VSC.
	Magnification	Q1d bears black text produced with a different printing process (4-color inkjet) than Q1a, Q1b, and Q1c (black only inkjet).
	Video Spectral Comparator (VSC)	Q1d shows visible dissimilarity from Q1a, Q1b, and Q1c when exposed to UV (ultra-violet) light (including 365nm, 312nm, and 254nm). Q1d bears a signature that was produced by 4-color inkjet rather than the liquid/gel ink that was used on Q1a, Q1b, and Q1c. Q1d contains more IR (infrared) reactive fibers than Q1a, Q1b, and Q1c.
	ESDA	Similar paper feed-roller marks developed on the back sides of Q1a, Q1b, and Q1c using the ESDA2 but did not develop on Q1d.

TABLE 2

WebCode	Methods/Techniques	Observations
WD6HL6	Video Spectral Comparator (VSC)	All the pages comprising the disputed item were superimposed and illuminated with 365 nm UVA light. Page 4 was observed to have different reaction than pages 1, 2 and 3. In the same superimposition, a misalignment of the box containing the information about the person and the course taken was observed; it is tilted to the right. This misalignment causes the information contained within to become misaligned. Although the front appears to match, the printing system used on page 4 is different from that used on pages 1, 2 and 3. The words printed in red, serving as a security background for the questioned document, are printed with less line spacing than those on pages 1, 2 and 3, which are printed in blue.
WMRDPR	Video Spectral Comparator (VSC)	By using magnification a difference in the type of printing used in the background pages of the examined document is observed, the first , second and third pages were printed by inkjet printing. However, the fourth page was printed by other technique. The various lights source of the VSC were used (i.e IR , oblique) to examine the document. By using IR light , it was observed that the university logo disappeared in the first , second and third pages, but the university logo was visible on the fourth page . That is due to the difference of absorption. By using oblique light, there was significate and evident writing pressure in the signatures in the first , second and third pages due the signatures were written by hand. However, there was no writing impression in the signature on the fourth page as it was printed.
	ESDA	By using ESDA ,the university logo was visible on the fourth page in examined document but the other pages were not.
	Visual Examination	there was difference in the background colour between fourth page in the examined document and the others .
WTGV33	ESDA	Negative results for the four pages.
	Video Spectral Comparator (VSC)	Different interactions between pages 1-3 and page 4. - At 365 nm, school logo has a different appearance between pages 1-3 and page 4. - Under 780nm, for pages 1-3, the watermarks (school logo and “Center Square University”) disappear and the inked signatures are barely visible. As for page 4, at 780nm, the watermarks are still slightly visible and the signature is still visible. - Under UV, all four pages interact similarly, all UV active.
	Visual Examination	- All four pages are on letter size paper ~8 ½ x 11 inches. - Differences in colours between pages 1-3 and page 4 for the school logo and “Center Square University” watermark as well as the overall colour of the pages.
	Microscopic Examination	- Similar printing process between pages 1-3 and page 4 (inkjet), but possibly different ink and/or different printer. Pages 1-3 have all the same similarities, while page 4 is different. Under the microscope, page 4 is more blurry compared to pages 1-3. - Signatures on pages 1-3 are written in liquid ink while the signature on page 4 is printed. - Similar fonts between all four pages.
	Photoshop	- Photoshop was used to overlay the pages. The borders of pages 1-3 overlay perfectly together. The borders of page 4 do not overlay perfectly with either pages 1-3.

TABLE 2

WebCode	Methods/Techniques	Observations
WYLUET	Macroscopic/Microscopic Examination	Se observa en la cuarta hoja que conforma al documento texos impresos con bordes definidos y mayor reflexión de la luz blanca directa, mientras que en las tres hojas restantes los textos impresos se observan dentados y opacos. [Translated by CTS: On the fourth sheet of the document, printed texts are observed with defined orders and greater reflection of direct white light, while on the three remaining sheets, the printed texts are observed to be jagged and opaque.]
	Video Spectral Comparator (VSC)	La cuarta hoja que conforma al documento custionado reacciona diferente a las fuentes de luz infrarroja y fluorescente con respecto a la 1, 2 y 3. [Translated by CTS: The fourth sheet that makes up the questioned document reacts differently to infrared and fluorescent light sources with respect to sheets 1, 2 and 3.]
X3L3H3	Microscopic Examination	Printing techniques - signature on page 4 is printed with ink jet. Signatures on page 1, 2, and 3 are made with handwriting
	Video Spectral Comparator (VSC)	Different reaction in inks in signatrue on page 1, 2 and 3 compared to page 4 Different reaction in paper on page 1, 2, and 3 compared to paper in page 4
	Transmitted Light	Different structure in paper for page 1, 2 and 3 compared to page 4
X7GUNE	ESDA	The questioned document was examined for marking or writing impressions. The back side of pages 1-3 had a rectangular marking impression and page 4 did not.
	Video Spectral Comparator (VSC)	The page 4 sheet of paper appears slightly brighter than the other pages under UV source. VSC images also exhibit a dissimilarity in the inks: the writing instrument inks on page 1-3 reflect and the inkjet printing process ink absorbs under IR source.
	Microscopic Examination	Pages 1-3 bears a signature produced with a writing instrument and Page 4 was produced with an inkjet printing process machine. There is more black ink in the printing of “Center Square University” on page 4 vs. pages 1-3.
	Visual Examination	The color printing on page 4 had a warmer yellowish hue overall vs. pages 1-3 had a cooler bluish hue (visual analysis under visible light).
	Overlays	The alignment of the printing on page 4 is slightly higher than the other 3 pages.

TABLE 2

WebCode	Methods/Techniques	Observations
XC8ADL	Macroscopic/Microscopic Examination	Through direct observation and the stereomicroscope, the following are observed: a) Document support: The substrate of the three folios "pg.1 of 4", "pg.2 of 4" and ""pg.3 of 4", of the "Center Square University Centerlande, Ohio - OFFICIAL TRANSCRIPT", does not show signs of manipulation by erasure, scraping, since there are no broken, curly fibers or thinning of the paper, which indicate the use of physical, chemical substances or abrasive means to remove information. The substrate of the folio "pg.4 of 4" has a whiter hue than the other pages. b. Information on each page: The three folios "pg.1 of 4", "pg.2 of 4" and ""pg.3 of 4", of the "Center Square University Centerlande, Ohio - OFFICIAL TRANSCRIPT", have the header, background design, logo of the university embodied in the Ink-Jet printing system, observing small dots of blue, red and yellow clearly defined; data such as dates, grades, student identification, among others, in black, were also captured in Ink-Jet printing and have undefined edges and the signature is made in ink, that is, it corresponds to a handwritten signature. Meanwhile, the folio "pg.4 of 4" of the "Center Square University Centerlande, Ohio - OFFICIAL TRANSCRIPT", presents header, background design, logo of the university, data such as dates, grades, student identification (in black) and signature, were captured in Ink-Jet printing, which leaves defined edges.
	Video Spectral Comparator (VSC)	-Ultraviolet light: The support or paper of the document "Center Square University Centerlande, Ohio - OFFICIAL TRANSCRIPT", when exposed to ultraviolet light, shows spectral differences since page 4 is fluorescent, while the paper of pages 1, 2, 3 is opaque. Absorption: The constituent elements of the document such as printouts and signatures, when exposed to infrared radiation, show differences only in terms of the signature found on "page 4", when it is observed that at 850 om the traces of the same are observed in black. Focus: The constituent elements of the document, such as printouts and signatures, when exposed to spotlight light, show differences in luminescence observed in the signatures on pages 1, 2 and 3, while the signature printed on "page 4" is seen in black.
XG4TG6	**No Methods or Observations were reported by this participant.**	
XKHQM8	Visual Examination	• The document contains four letter size white pages. • Aligned margins. • Aligned inden. • No spots of the support material of the documen. • No misalignment is observed on the interlinear spaces. • No irregular spacing and alignment is present, vertical or horizontal. • A different tone is observed on the support material of page four of the document. • There is a different tone on the background of the printing on page four of the document.
	Microscopic Examination	• A different texture of the paper is observed (on page four), compared with pages one, two, and three. • The central coat of arms and the printing background on page four of the questioned document show a different tone from pages one, two, and three. • The format and filling out of the document information on pages one, two, and three, show differences regarding the printing quality and definition, compared with page four. • It is observed that the printing system of the signature that appears at the bottom of page four is different, compared with the previous three pages of the document, meaning such signature was printed with the same printing system as the total content of the text on page four (inkjet printing system).

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	• When subject to raking light, no liftin of the paper fibers is observed. • When applying transmitted light, no reduction of the paper mass is observed. • When applying ultraviolet light, more opacity is observed on the first three pages of the document compared with the last (page four). • Under infrared light, a different direction is observed between the handwritten signature on the first three pages compared with the digital signature printed on page four. • Under infrared light, no variations or reactions relevant on the format are observed. • The document format, as well as the filling out of the information, show differences regarding the printing quality and definition between pages one, two, and three, compared with page four.
XLXVJJ	Macroscopic/Microscopic Examination	Clearly visible difference between pages 1 to 3 (printer A) and page 4 (printer B) in the deposition characteristic of the inkjet printer used. Handwritten signature on pages 1 to 3. Signature on page 4 produced by inkjet printer.
	Ultraviolet Light	Clearly visible difference between pages 1 to 3 and page 4.
	ESDA	No traces / evidence found
	Thickness	No discernible difference between the individual pages.
XV3ZBZ	Macroscopic/Microscopic Examination	Halftones of page 1, 2, and 3 are different from those of page 4.
	Visual Examination	Bending strength of the page 4 does not match with other pages. Color of the university sigil of page 4 is reddish than the sigil of page 1, 2, 3.
XYJ3H7	Magnification	The magnification was used to examine the document
	Visual Examination	The visual was used to examine the document
	Macroscopic/Microscopic Examination	The macroscopic was used to examine the document
	Ultraviolet Light	The ultraviolet light was used to examine the document
Y4NKU4	Microscopic Examination	Observed that the printing of the fourth page of the transcript differed from that of the first three pages. Also, that the signature of the fourth page was part of the printed image whereas the signature on each of the first three pages had been written with a ball-pen.
	Oblique Light	Observed reverse side embossment on the back of each of the first three pages caused by the writing of the signature but not on the back of the fourth page. Also, each of the four pages had a similar surface texture. No indentations of writing observed.
	Transmitted Light	The "mottle" of the paper of the fourth page differed slightly from that of the first three pages but possibly not sufficiently to be significant.
	Ultraviolet Light	Use of 365nm UV showed nothing of apparent significance.
YBAFV8	Visual Examination	The physical characteristics of the substrate and the execution of the three-page contract identified as item Q1 were analyzed. When viewed directly the background print on page 4 is observed to be different in tone, both in the light gray text and the circular university crest.

TABLE 2

WebCode	Methods/Techniques	Observations
	Magnification	The physical characteristics of the substrate and the execution of the three-page contract identified as item Q1 were analyzed. When viewed directly and using optical instruments such as magnifying glasses, the background print on page 4 is observed to be different in tone, both in the light gray text and the circular university crest.
	Video Spectral Comparator (VSC)	Upon closer inspection, using magnifying instruments such as magnifying glasses and a VSC video comparator, pages 1 to 3, and then page 4, it can be seen that page 4 was printed on a different printer, as it does not present the same result in the dot tonal characteristics and colors of the text and figures observed on the first three pages. Additionally, it was found that the signature "authorized by" on page 4 was not directly printed by a writing instrument but is part of the digital printing process. This means that the background, execution, and signature of the document are on the same printing plane.
YG2NF2	Microscopic Examination	Pages 1-3: (a). The questioned printed matter was observed to consist of shiny 'black' characteristics which rested on the paper fibres. (b). The questioned printed matter was observed to consist of 'feathering' characteristics at the edge of each letter / number. (c). The questioned signature was observed to be handwritten evident by the presence of the depression in the center of the pen strokes of the entire signature. Page 4: (a). The questioned printed matter was observed to be much duller than the pages 1 - 3. (b). The questioned printed matter was observed to lack the 'feathering' characteristics at the edge of each letter / number. (c). The questioned signature was observed to be a 'printed signature' evident by the absence of the depression in the center of the pen stroke of the entire signature, which consisted of yellow, blue and pink circular dots along the entire pen strokes.
	Transmitted Light	Pages 1 - 4: No watermark was observed.
	Ultraviolet Light	Pages 1 - 4: The paper was observed to fluoresce of a blue colour.
	Infrared - Reflectance	Pages 1 - 3: (a). The circular University Symbol 'CENTRAL SQUARE UNIVERSITY' in the middle of each page was observed to disappear at wavelength 715nm. (b). The questioned signature was observed to disappear at wavelength 780nm. (c). The questioned black printed matter did bot disappear throughout the wavelength - ranges 645nm to 1000nm. Page 4: (a). The circular University Symbol 'CENTRAL SQUARE UNIVERSITY' in the middle of the page did not disappear throughout the wavelength - ranges 645nm to 1000nm. (b). The questioned signature did not disappear throughout the wavelength - ranges 645nm to 1000nm. (c). The questioned black printed matter did not disappear throughout the wavelength - ranges 645nm to 1000nm.
	Infrared - Fluorescence	Pages 1 - 3: No fluorescence was observed. Page 4: (a). The University Symbol 'CENTRAL SQUARE UNIVERSITY' in the middle of each page was observed to fluoresce much brighter. (b). The drawing of the book in the circular University Symbol 'CENTRAL SQUARE UNIVERSITY' was observed to different in formation to that on pages 1 - 3. (c). The paper fibres were observed to fluoresce in a scattered pattern all over on page 4.
YGF8ZY	Video Spectral Comparator (VSC)	Under the UV, page 4 is much brighter than other pages.
	Oblique Light	A signature of the page 4 is photocopied, but signatures of other pages are written.

TABLE 2

WebCode	Methods/Techniques	Observations
YKXA84	Video Spectral Comparator (VSC)	To examine the academic transcript.
	Visual Examination	To examine the academic transcript.
	Macroscopic/Microscopic Examination	To examine the academic transcript.
	Ultraviolet Light	To examine the academic transcript.
YTREZ6	Microscopic Examination	Microscope "Leica M205C"
	Video Spectral Comparator (VSC)	"Projectina Spectra Pro+"
Z2FPM7	Macroscopic/Microscopic Examination	Scientific method taking into account the phases of: observation, indication or pointing out of distinctive characteristics (individualizing characteristics), confrontation and identity judgments.
	Video Spectral Comparator (VSC)	Macroscopy and microscopy are used in the technical-scientific methodology for the direct and instrumental observation of samples, using specialized equipment that allows, together with the different digital magnifications and the combination with lighting sources: episcopic, transmitted, grazing, oblique, retroreflective, coaxial, among others, to visualize in a general way and in detail the characteristics that the inks in a document have.
	comportamiento de la tinta en un rango determinado del espectro	Instrumental analysis techniques with different light sources (natural, episcopic, transmitted, grazing, oblique, retroreflective, coaxial, among others), electromagnetic radiation (infrared, ultraviolet, among others), band-pass filters and digital magnifications, combined with spectral analysis of infrared absorption and fluorescence, which the VSC 6000HS spectral document video comparator has, will allow to objectively establish if there are differences in the behavior of two or more types of ink in a given range of the spectrum.
Z7U6FH	Visual Examination	- visually pg. 4 appears different; the Center Square University repeating background is lighter/is a diff. color on pg. 4 than the other 3 pgs; the orange colored circular seal/design is also a different shade/color than the other pgs; the black ink on the pg. also appears darker on pg. 4 than the other pgs. - the top and bottom margins of pg. 4 also appear to be slightly off; this is visible by holding the pages up to the light and overlaying them; can also be seen by laying side by side and lining up the rectangular box lines
	Video Spectral Comparator (VSC)	The printing processes, paper, and inks used on pages 1-3 of the questioned transcript in Item #1 could not be differentiated. The printing processes, paper, and inks used on pages 1-3 of the questioned transcript in Item #1 could be differentiated from page 4. No visible indented writing.
	ESDA	No developed indented writing.
Z8682G	ESDA	No latent indented writing was detected on any of the papers using the ESDA procedure.

TABLE 2

WebCode	Methods/Techniques	Observations
	Video Spectral Comparator (VSC)	The papers designated 1-3 are identical to each other in their optical-physical properties. The paper designated page 4 differs from the remaining papers (pages 1-3) in its optical-physical properties, such as cloudiness, IR fluorescence, and UV fluorescence. This indicates page 4 is from a different production source. Furthermore, pages 1-3 exhibit traces of contamination visible under UV light on their reverse sides, whereas page 4 lacks such contamination marks.
	Microscopic Examination	All pages were printed using the inkjet method, but he print on the paper designated page 4 differs in its print characteristics from that on pages 1-3. Unlike the signatures on pages 1-3, which were written by hand, the signature on page 4 was applied electronically.
	Visual Examination	By using multiple light sources and magnifications no mechanical or chemical alterations to the entries could be detected on any of the pages.
ZABRTN	Macroscopic/Microscopic Examination	The outline of the writing on pages 1 to 3 is observed to have irregular edges, while the writing on page 4 has regular edges. The security background on pages 1 to 3 is seen to be sharp and clear, while that on page 4 is seen to be distorted and unclear.
	Video Spectral Comparator (VSC)	The signatures on pages 1 to 3 show grooves, ink absorption in the support and shine at different angles of incidence. The graphics on pages 1 to 3, compared to those on page 4, react differently when different light sources are applied to them.
	Visual Examination	The color of the security background, letterhead, and logo on page 4 differs from pages 1 through 3.
ZLMX6P	Visual Examination	The questioned document Q1 is a white four-page academic transcript. Each paper measures approximately 280 x 215 mm. Each paper has handwriting in the form of a signature which by visual examination appears to be made with a pen with black ink. The signature on page four is longer (possibly two signatures) than the signatures on page one to three. On page four, the signature is next to the text "Authorized by", whereas on pages one to three, the signature is next to the text "Verified by", and the font size on page four is smaller than the font size on page one to three. The black square surrounding the transcript varies in placement from page four to page one to three. The colors on the print also vary from page four to page one to three. Page four appears more white compared to page one to three.
	ESDA	An Electrostatic Detection Apparatus (ESDA) was used to search for indented impressions on both sides of each paper. The ESDA analysis showed that page four differs from page one to three. Page four has indented impression from the entire print, including the signature. Page one to three has indented impressions from the signatures only.
	Video Spectral Comparator (VSC)	Using magnification, the signatures on page one to three is written using a pen with black ink (originals), whereas the signature on page four is printed using inkjet. All four pages are printed using an inkjet printer, however page four differs in type of inkjet printer used, both by colors and by the distribution of the ink droplets. Comparing the visual characteristics of the four pages, page four differs in color and structure from page one to three under ultraviolet light and transmitted light.

TABLE 2

WebCode	Methods/Techniques	Observations
	Handwriting Examination	It is assessed that all signatures are made by the same person. However, page four differs in its design by being longer (possibly two signatures) and printed. The signature itself is characterized by being a short and simple signature. There are no obvious signs of a free hand forgery, but the signature/signatures on page four could be inserted/electronically transferred from another document.
	Thickness	The thickness of all four pages was measured using a micrometer, but the results were inconclusive. The slight difference in thickness measurements may be due to the fault tolerance of the micrometer.
	Weight	All four pages were weighed, but the results were inconclusive. The small difference in weight between the pages may be due to the weight of the ink.
ZTNCPR	Video Spectral Comparator (VSC)	Page 4 reacted differently to that of Pages 1 to 3, when exposed to a specialised light source, indicating different paper. Pages 1 to 3 is UV dull and Page 4 is UV bright.
	Microscopic Examination	The signature on Page 4 is a printed signature.
	Microscopic Examination	The printing on Page 4 is not as clear as Pages 1 to 3 and is of poor quality.
ZVEDTU	ESDA	ESDA examination for indented writing of value yielded negative results.
	Video Spectral Comparator (VSC)	Infrared reflectance and infrared luminescence examinations revealed that multiple writing inks were used on the questioned documents. The writing inks on pages 1 through 3 were differentiated from page 4.
	Macroscopic/Microscopic Examination	The visual examination of the inkjet printing revealed that pages 1 through 3 were differentiated from page 4.

Response Summary

Participants: 197

Methods Utilized

ESDA	74	Magnification	27	Thickness	6
Handwriting Examination	10	Micrometer	8	Transmitted Light	25
Indented Writing	17	Microscopic Exam	96	UV Light	40
Infrared Light	27	Oblique Light	31	Visual Exam	86
Macroscopic Exam	12	Overlays	15	VSC	158
Macroscopic/Microscopic Exam	0	Ruler	20		

Note: Methods listed are the preloaded options for selection via the CTS Portal and do not reflect all answers provided by participants.

Conclusions

TABLE 3

WebCode	Conclusions
24JMWD	The text and printed material appearing on pages 1 - 3 in Item Q1 was produced by ink jet technology. The "Verified by" signature/initials appearing on pages 1 - 3 was written with a black, non ballpoint ink. The text and printed material appearing on page 4 in Item Q1, as well as the "Authorized By" signature, was printed by a different printer than the printer used to prepare pages 1 - 3. Ultraviolet and infrared examination of the pages in Item Q1 also revealed different optical whiteners and brighteners in page 4 than in the pages 1 - 3, indicative of a different paper used for page 4 than pages 1 - 3.
29VT8D	3.) The questioned documents, Q01-01.1 - Q01-01.4, were viewed macroscopically, microscopically, and with various light sources filters, functions, and magnification using the Video Spectral Comparator (VSC). Based on the evidence received, it appears that the four-page academic transcript, further labeled as Q01-01.1 - Q01-01.4, has been altered.
2CU3KZ	As a result of visual/microscopic examination, measurement, and VSC examination, it was found that the fourth page of the submitted academic transcript showed different characteristics compared to the other three pages. Therefore, it is concluded that the questioned document has been altered.
2GAEGG	In my opinion, page 4 of the Center Square University Official Transcript is an additional page to added to the first three pages and as such the document cannot be regarded as authentic and unaltered.
2QB29E	the document was altered: the examination of the document showed that page 4 was prepared differently from pages 1-3.
2Z3H2N	All 4 pages of the document are produced on white A4 format office paper sheets, on one side of the each page, using the color inkjet printing method (color inkjet printing technique). The shades of the colored inks used on page 4 differ from the other remaining three document pages; there is a different drop structure (as if blurred), which may indicate different printing mechanism. The fact that the inks differ, the paper structure differences, and the signature is not handwritten, may indicate that page 4 could be a copy or forged (generated by computer or a modified copy of an existing document). Conclusion: it is probable (conditional) that page 4 could have been altered (replaced). A categorical answer cannot be given because no more examples printed with this document's printing equipment (there were too few pages examined) and using such paper were provided. Also, the digital files of the document were not available (it is unknown what the computer settings were when printing all pages). The paper and inks used were not chemically examinated (such chemical examination are not performed in the Document Examination Unit). Since the paper of page 4 and the other three pages is different, the same inkjet print may look different on page 4 (visual difference). On page 4, the black printed elements (strokes) have a larger yellow "shadow" than the other 1-3 pages (corresponding black elements/strokes). All pages are inkjet printed. However, on page 4, characteristics such as ink drop volume, paper absorption properties, and ink spreading differ, making it impossible to identify the printer from analyzing one area. We did not detect any printer deffects (printing mechanism, clogged nozzles, etc.) across all 4 pages.
36A93A	I have conducted visual, magnified, ESDA, overlay and spectral examinations of the 4 pages of Item Q1 for evidence of alteration. Differences have been observed between page 4 and pages 1 to 3, being differences in paper, printing and alignment where comparable, and in signature production with it being printed on page 4. Pages 1 to 3 display no differences to each other in paper, printing, alignment where comparable and all display written signatures. As a result of my examination it is my opinion Item Q1 has been altered with page 4 being produced at a different time and with a different printer than pages 1 to 3.
37MZT6	Due to lack of original signature on page 4, the inconsistent margin alignment on page 2, and disagreement in optical characteristics of the printing ink between pages 1 through 3 and page 4, the Item 1 questioned document has probably been altered. A more definite conclusion could not be reached due to limited sufficient reference material for comparison.
3G4KEM	As a result of examination and comparison based solely on the material submitted the following

TABLE 3

WebCode	Conclusions
	conclusions and observations are opinions based upon my experience, education and training are as follows: The entire Q4 page has been inserted and is therefore considered as an alteration to the original document.
3LEU6V	The document examined visually, microscopically, and instrumentally to determine whether alteration were made on the document. The document printed with sans serif font using inkjet printer. The examination revealed indications of alteration and discrepancies on page 1-4 in comparison to pages 1-1 through 1-3, as detailed below: The color of the university logo and the red title text "Center Square University" on page 1-4 differs from those on pages 1-1 through 1-3. The signatures on pages 1-1 through 1-3 were written using a writing instrument, while the signature on page 1-4 was printed. Pages 1-1 through 1-3 exhibit a different reaction compared to 1-4 when exposed to different light sources and filters. The black printing on 1-1 through 1-3 printed by using black inkjet ink, while the black printing on 1-4 printed by using color inks.
3NPH4A	The findings provide extremely strong support for the proposition that the original page 4 of questioned document has been substituted.
3Q9UJQ	The questioned document consisting of academic transcripts under the name of Susan Smith, is ALTERED.
3QAMGY	THE QUESTIONED DOCUMENT CALLED ARTICLE Q1: FOUR-PAGE ACADEMIC TRANSCRIPT PROVIDED BY SUSAN SMITH TO THE EMPLOYER, IF IT HAS BEEN ALTERED.
3WHTD6	Alterations Were Detected It was determined that the Item 1 (Item Q1) document was altered based on the following observations: • various horizontal and vertical misalignments on pages 2, 3 and 4, • a duplicate and out of sequence semester year (FALL 2023) on pages 2 and 3, • differences in printing quality and characteristics between page 4 and the remaining pages, and • differences in optical characteristics of the paper between page 4 and the remaining pages.
4NLAEM	During the examination I reached the conclusion that alterations are present on "Item Q1".
4V6HXD	The study under stereoscopic microscope allows to observe that the printing method used for printing pages 1, 2 and 3 is different than the method used for printing page 4. The characteristics of signatures on pages 1, 2 and 3 indicate that are original signatures. Signature on page 4 is printed.
6CK7MX	In my opinion, the page 4 of the academic transcript is not genuine.
6KG4A2	The OFFICIAL TRANSCRIPT document in question was altered, as the entire last page was printed on a different printer than the one that printed the first three pages of the document in question.
6LQDZD	1. Visual, microscopic, ultraviolet light box and the VSC (Video Spectral Comparator) examination revealed the following: a. Non-impact print process (inkjet). Color and quality differences between Q1-Q3 and Q4. b. The signatures on Q1-Q3 are original. The signature on Q4 is reproduced. c. Ultraviolet fluorescence of the paper substrate in Q1-Q3 are different from the ultraviolet fluorescence in Q4. d. Difference in optical properties of the ink in Q4 and Q1-Q3. The background and signature of Q4 did not drop out, however, it dropped out in Q1-Q3. Q3 and Q4 used for reporting purposes. See page 3 for interpretation. 2. Lab item #1, Invoice #Q201201 was examined utilizing oblique/side lighting and EDD (Electrostatic Detection Device) for the possible presence of indented impressions. Indented impressions were not observed. Aside from the laboratory number, lab item number, envelope outline, paper outline, or extraneous markings, an impression of the overall document of Q4 was observed which was not observed in Q1-Q3. Q1 (Front) and Q4 (Front) used for reporting purposes. See pages 4 and 5 for interpretation. 3. Utilizing visual, microscopic, ultraviolet light box examinations and the VSC (Video Spectral Comparator) it was revealed that the document was altered by page substitution, page Q4.
6M6DLM	The components of the paper on pages 1, 2, and 3 which are colour, thickness of ink on the background printing and uneven edges on the printing differs from those of page 4, therefore I concluded that the academic transcript has been altered.

TABLE 3

WebCode	Conclusions
6RC4NT	Physical, microscopic, instrumental, and comparative examinations resulted in the following: Item Q1 has been altered by page substitution of page 4. This finding is supported by the following: Pages 1 through 3 are inkjet printed with an inked pen signature; page 4 is inkjet printed with an inkjet printed signature. The black text on pages 1 through 3 are printed with black ink; the black text on page 4 is printed with cyan, magenta, yellow, and black (CMYK). Page 4 is optically brighter than pages 1, 2, and 3. Page 4 responds differently (more fibrous) than pages 1, 2, and 3 when viewed under spot IR luminescence. The background printing and center seal drop out of visibility under IR (780 nm) on pages 1, 2, and 3; the background printing and center seal remain visible under IR (780 nm) on page 4. An examination of Item Q1 utilizing the Electrostatic Detection Apparatus (ESDA) did not reveal the presence of indentations. Banding was observed on the reverse sides of each page. It could not be definitively determined if the same banding seen on pages 1 through 3 is or is not present on page 4. No further evidence of alteration was noted.
7B6AUY	Based on the physical and instrumental examinations of Item 001, the following was determined: Item 001 was highly probably altered through substitution of page 4. The lack of submission of a genuine/standard transcript for comparison was the limiting factor in this examination. No decipherable impressions were developed on Item 001.
7B9QTX	The questioned document has been altered.
7BND3Y	[No Conclusions Reported.]
7RAVVZ	The document under inspection (academic record consisting of four pages) shows alteration in the form of replacement, because page 4 was replaced in its entirety.
8G7ZEF	Page 4 of the document under study that comprises Susan Smith's academic record, prepared on letter-sized paper and usable on the front, does present discordant characteristics compared to pages 1, 2, and 3 in relation to the printing tone, type of printing, and font, and with a discordant reaction when viewed under infrared light. Therefore, the academic record is considered to have been altered.
8WL4W6	The four pages of the questioned document (Item Q1) were examined. Comparison among the four pages revealed that the colour of the page 4 was different from those of pages 1 to 3. Moreover, comparison of the page 4 with pages 1 to 3 also revealed discrepancies in optical properties of the paper, background printing and overprinting. Furthermore, the signature on page 4 was inkjet printed while the signature on each of pages 1 to 3 was handwritten. In view of the aforementioned observations, I am of the opinion that the original page 4 of the questioned document had been substituted and thus the questioned document has been altered.
96AG9A	The academic transcript issued by Center Square University in Ohio to Susan Smith, dated February 18, 2001, is a falsified document, as one of its pages, specifically page 4, is not part of the transcript.
99VYTF	Page 4 of the document under study that comprises Susan Smith's academic record, prepared on letter-sized paper and usable on the front, does present discordant characteristics compared to pages 1, 2, and 3 in relation to the printing tone, type of printing, and font, and with a discordant reaction when viewed under infrared light. Therefore, the academic record is considered to have been altered.
9JEDWH	There are a number of differences between pages 1 - 3 and page 4 of the document including the paper and printed details. In addition, the signatures on pages 1 - 3 are original signatures applied using black fluid ink, whilst that on page 4 is a non-original signature. In my opinion, the findings provide greater support for the proposition that the document has been altered, rather than the alternative that it has not been altered. It is not possible to provide a stronger opinion without information about other genuine transcripts produced by the university.
9LGFJX	The questioned document (Q1) has been altered by the substitution of the fourth page.
9MPMMQ	While inconsistencies were observed in the manner of production/issuance between page 4 and the rest of the questioned document; no evidence of altered or modified entries were observed. Although

TABLE 3

WebCode	Conclusions
	production differences within a multi-page document are unexpected, without specimen documents or production/issuance specifications meaningful evaluation of these inconsistencies is not possible.
9R42RK	The exhibit in question is an altered academic transcript.
9R8QUW	From examination of documents QD, results that pages 1,2 and 3 are printed with same technique INK-JET, and they have same signature on it. Signature all the documents are with panicle. While from examination in QD, page for results with different printed technique INK-JET (different from pages 1.2 and 3) and the document on it maintains two signatures with INK-JET printing technique.
9Y4MGY	It is concluded that the questioned document has been altered by the insertion of page number four.
AN4CLW	In order to respond to the request, a preliminary inspection of the EMP and EF under study was initially conducted to verify compliance with the suitability requirement established in the FGN's "INSPECTION OF ALTERATIONS IN PRINTED AND HANDWRITTEN DOCUMENTS" protocol for this type of study. It was found that the four (04) pages (academic transcript provided by Ms. Susan Smith) were in the original, and therefore the Inspection of Alterations in Printed Documents is being carried out. Subsequently, through the use of the video spectral comparator, which allowed the exposure of the substrate of the elements of doubt to visible light with an incident angle, as well as different wavelengths, specifically ultraviolet spectra, in order to identify, through physical phenomena of luminescence, characteristics or elements that show the alteration, where it is possible to appreciate that the document (four (04) academic record pages provided by Mrs. Susan Smith), shows different characteristics regarding page 4 in its printing system, caliber of the letters and chromatic tonality; in addition, it is evident that the signature present on page 4 is printed; contrary to the rest of the document where the signatures on pages 1, 2 and 3 are observed in the original, which is the condition where the scribe, the writing element and the support directly interact. According to the study, the following was determined from the items submitted for inspection: The document under inspection shows an alteration on page four of the academic record provided by Ms. Susan Smith, in the substitute form; however, it was not possible to establish the original text.
BGDGYJ	Sí se encuentra alterado el documento identificado como "Q1: Transcripción académica de cuatro páginas proporcionada por Susan Smith al empleador". [Translation by CTS: The document identified as "Q1: Four-page academic transcript provided by Susan Smith to the employer" has been altered.]
BHUFE3	1. The Evidence Description below is clarified as follows: Exhibit 1(1-4) – College transcript 2. Based on an examination of Exhibit 1(1-4), it was determined that the questioned document has been altered.
BJ6H22	It was determined that the 4th page of the Academic Record, FEN 112.830.659, displayed a number of significant differences to the 1st, 2nd and 3rd pages of this record. This includes the physical and optical characteristics of the paper substrate, the colour and morphology of the printing ink and the presence of non-original signatures. It is my opinion that Page 4 of the Academic Record was generated using different paper and processes to Pages 1, 2 & 3.
BQYMU3	Indentations/embossments were observed on the back sides of pages 1, 2, and 3 of the transcript. Inks dropped out on pages 1, 2, and 3 of the transcript, but not on page 4. The background dropped out on all pages; however, the background on page 4 lightened but did not completely drop out. Paper fibers were fluorescing on all 4 pages of the transcript, but there were more fibers fluorescing on page 4. Additionally, the inks for the initials were fluorescing on pages 1, 2, and 3. Ink for the signature on page 4 did not fluoresce under any spot light color.
BVVCDU	SOLE CONCLUSION. - The four-page transcript in the name of Susan Smith, submitted as a QD package, is indeed altered by deletion and addition of a page (page number 4). This is due to the technical reasons stated in the body of this report.
BVW49G	The document marked Q1: 4-page academic record provided by Susan Smith to the employer, presents alteration by addition.

TABLE 3

WebCode	Conclusions
BWDZYV	Through the support of the different equipment and special illuminations such as diascopic, episcopic, infrared and fluorescence, it was observed that the fourth sheet of the questioned material was changed in its entirety, which is evidenced by the difference in the chromatic tonality of the substrate, the chromatic tonality of the inks used, the thickness or caliber of the texts, the behavior under the influence of UV light differs and the characteristics of the print vary, so it can be determined that it presents a substitute alteration of the fourth sheet.
C2EYK6	In view of the above evidence, the four paged official transcript of Susan Smith has been altered.
CA92QM	It was determined the questioned transcript has been altered.
CGUXUC	Based on examinations and comparisons between pages 1 through 4, using an oblique light source, various additional light sources and filter combinations, and the stereomicroscope multiple differences were noted. Additionally, the final "Authorization" signature is not an original signature. It is photocopy of a signature. A signature comparison was not conducted due to the fact that the signature on page 4 is a copy. (NO EXAM)
CH38KN	Result: In the evidence received corresponding to the document identified as "OFFICIAL TRANSCRIPT" from Center Square University, which consists of 4 pages, alterations due to grafting were detected on folio 4. When comparing all the pages, it was observed that folio 4 presents differences with respect to folios 1, 2, and 3; the whole document is printed using an inkjet printing system, however the folio 4 shows differences in the finish, tonality, and dispersion of ink droplets. Furthermore, when exposed to fluorescent dot light, they exhibit different optical behavior, indicating that the nature of the inks is different. The apparent signatures on the pages are an electronic reproduction, where the color separation, flat printing, and irregular edges can be observed. Interpretation : The questioned document has been altered.
CKFGZF	In light of the above-mentioned observations I reached a conclusion that the academic transcript marked Q1 has been altered
CMKARU	Sole conclusion. - The document called "OFFICIAL TRANSCRIPT", identified as exhibit 7, has been altered by deletion and addition. The foregoing is due to the technical reasons described in the body of this study.
CRDA7P	Document Q1 consists of four pages. Page Q1 has different physical characteristics when compared to pages 1-3. Document Q1 has been altered.
D2VB2P	Examinations revealed that the text and format pages 1-3 were produced with a different printing process from that used to produce page 4. The signatures appearing on pages 1-3 are original "wet ink" signatures. Further examinations revealed that page 4 of the Questioned Document is a machine color copy and the signature appearing at the bottom is a non-original signature and was produced as part of the same copy process. It is this examiner opinion that page 4 is a color machine copy and was not prepared in concert with pages 1-3.
D6UNNE	After examination of the disputed academic transcript, I concluded that page 4 of the academic transcript is fraudulent.
DBZHGP	The Q1 document demonstrates characteristics indicative of alterations.
DHHTR6	Page 4 of the questioned document shows differences from pages 1, 2 and 3 of the document, for example in terms of: the type of paper used, the properties and characteristics of the ink-jet printer, the properties of the printer inks. In addition, the signatures on pages 1, 2 and 3 in the “Verified by:” positions were written directly on the paper, while the signature(s) in the "Authorized By" position on page 4 of the disputed document were printed using an ink-jet printer.
DPKZBE	Based on the aforementioned observations, I came to the conclusion that the document in question has been altered, as page 4 was replaced.

TABLE 3

WebCode	Conclusions
DY9QVK	Page 4 has been altered due to its margin of the box and quality of inkjet halftone.
E2ED9P	Pages 1, 2 and 3 have similarities in paper size and printing process. The writing ink used to produce the signatures on pages 1, 2 and 3 could have a common origin. Page 4 has dissimilarities in paper size and printing process compared to pages 1, 2 and 3. The signature on page 4 was produced as part of the printing and not using writing ink. Based on these findings, in my opinion, the examination of Item Q1 revealed evidence of alteration in support of the employer's claims. Therefore, the questioned document Item Q1 has been altered.
ELXF7A	Examination and comparison of exhibits Q1-Q4 were conducted, and the following conclusions and observations are based upon my education, training and experience and the results are as follows: Exhibits Q1-Q4 were scanned for preservation by Forensic Document Examiner XXX. An ESDA (ElectroStatic Detection Apparatus) examination for the detection and reading of indented writing, typing or other identifying impressions was performed on exhibits Q1-Q4. Exhibit Q3 contains one set of indentations that appear to be a gripper/feeder device from an electrophotographic machine. The indentation runs from the top to bottom of the paper in the middle of the document. The remaining documents were negative for indentations. Exhibits Q1-Q4 were examined with oblique/side lighting and the results are as follow: Negative impressions were located on exhibits Q1 and Q4. Exhibit Q2 contains indentations that appear to be a gripper/feeder device from an electrophotographic type machine from the top to bottom of the paper and the half-way down the right side of the page. Exhibit Q3 contains indentations that appear to be a gripper/feeder from an electrophotographic type machine in the middle of the document from top to bottom and half-way down the page on the left. A VSC (Video Spectral Comparator) examination was conducted on exhibits Q1-Q4, and the observations demonstrate that Q1-Q3 were created with an ink jet printer, and they are consistent and appear to come from one printer source. However, Q4 was created with an ink jet printer, but the dot pattern of inks utilized to make up certain colors differs from Q1-Q3 and demonstrates it is inconsistent and appears to come from another printer source than Q1-Q3. The paper in exhibits Q1-Q4 were examined with an ultra-violet light source and exhibits Q1-Q3 react consistently by appearing dark purple while exhibit Q4 appears to luminesce with a lighter purple which is inconsistent with exhibits Q1-Q3. The papers were examined with a micrometer and the four pages measured approximately .0045” inches hick. None of the pages contained a true watermark, however, they did contain a printed watermark. Exhibits Q2 and Q3 did appear to contain gripper/feeder marks that were inconsistent between the two pages. Exhibits Q1-Q4 were examined, and it was determined that they were created via an ink jet process. Exhibits Q1-Q3 were created by a different ink jet printer than exhibit Q4. Exhibits Q1-Q4 contain the same text in the top half of the document, while the lower portions contain varied text, but in the same fonts between exhibits Q1-Q4. Exhibits Q1-Q4 contain text in the wording “Center Square University” in the font Albertus Nova – 21 point; “Centerlande, Ohio” in the font Calibri – 9 point; “OFFICIAL TRANSCRIPT” in Lucida Sans Typewriter – 14 point; the demographic information in Lucida Sans Typewriter – 8 point and courses and grades in Lucida Sans Typewriter Bold – 7 point. Exhibit Q4 does not contain a raised or notary seal which is common practice on Official Transcripts for Universities. The document contains a non-original signature wherein exhibits Q1-Q3 contain an original aqueous ink signature. This examiner would also request the investigator find out what the protocol is for the University regarding the printing of official transcripts. Based upon the evidence submitted, it was determined that exhibit Q4 was a page insertion/substitution and supports that the official college transcripts were altered.
EQQKWT	It was determined the Item 1 document was altered based on inconsistencies within the text (alignment and content) that were noted throughout the document. Additionally, the Item 1 page 4 optical characteristics are inconsistent with the optical characteristics of Item 1 pages 1 through 3. No indented writing was observed during the examination of Item 1 using side-lighting and electrostatic processing. The signatures on Item 1 are not suitable for handwriting comparisons due to limited quantity and complexity. It should be noted that the signatures on Item 1 pages 1 through 3 are original, and the signature on Item 1 page 4 is non-original. Additional observations and assessments have been made regarding the submitted items and recorded for possible future examinations.

TABLE 3

WebCode	Conclusions
F3L99M	Pages 1-3 are consistent with being an original transcript. They have original ink signatures, similar paper stock and similar superior print quality. Page 4 has a non-original signature and the lesser print quality of the whole page is consistent with a second generation reproduction produced using colour ink jet technology. The page 4 paper stock is different from that used for pages 1-3, as confirmed by UV and IR examination. Whilst it is possible that the applicant mistakenly submitted a copy of page 4 as opposed to the original transcript, there are formatting irregularities on page 4 which raise the possibility of digital manipulation of the text.
F73K64	The paper material characteristics, print quality, ink behavior, droplet size, and chemical composition on the first three pages show consistency, whereas on the fourth page, these characteristics differ. The signatures on the first three pages were executed with a ballpen, while the signature on the fourth page appears to have been produced by inkjet printing.
F8UE4T	Alterations were detected Based on physical, optical, and printing inconsistencies, it was determined that Item 1 (Item Q1) was altered. Printing and optical inconsistencies were observed using the Video Spectral Comparator (VSC 9000) when comparing the printing, signatures, and paper for pages 1 through 3 with page 4 of Item 1 (Item Q1). Furthermore, alignment inconsistencies were observed amongst the Item 1 (Item Q1) pages and the 'Authorized By' signature on page 4 was a printed, non-original signature. No indented writing of value was observed using oblique lighting and/or electrostatic processing. The signatures on pages 1 through 4 of Item 1 (Item Q1) are of limited suitability and an individual is unlikely to be identified or eliminated as having prepared these signatures through handwriting comparisons. Additional observations and assessments have been made regarding the submitted item and recorded for possible future examinations.
F96GRC	Pages 1, 2 and 3 are inkjet printed and the signatures are original. Page 4 is entirely inkjet printed. In view of the observations under UV and IR and under transmitted light, page 4 does not conform to pages 1, 2 and 3.
FC4RNC	Based on the abovementioned observations, I came to the finding that the exhibit in question was ALTERED.
FDMJWW	Item #1 was examined for the presence of any alterations using non-destructive testing techniques (VSC 6000H/S, ESDA2), resulting the following observations and conclusions; - The printing process used to produce page 4 of item #1 is different than that used to produce pages 1, 2, and 3. - The signatures on pages 1, 2 and 3 of item #1 are original wet-ink signatures. The signature on page 4 of item #1 is NOT an original wet-ink signature. - All four pages of item #1 were processed for indented writing. No indented writing was developed. - There is evidence to support the contention that item #1 has been altered.
FHV2XB	In light of the above observations; I reached the conclusion that there are alterations on the documents. Page 4 was not printed together with pages 1;2 and 3.
FNWDP2	The examinations carried out allow us to conclude that the document in dispute has been altered by a substitution of page 4, which presents significant differences with the other pages of the document and is not compatible with continuous printing, page 4 being form a different printer on a different paper. The signature is also inkjet printed and not a handwritten signature, as on the other pages.
FUNHMC	Components of paper such as color, thickness of ink and background printing on pages 1, 2 and 3 are different from those of the page 4, therefore, the document has been altered.
G4Q3MJ	In general, page 4 differs in many respects from pages 1 to 3 in Q1. However, since the legitimate manner of production for this type of transcript is not known, the significance of these differences cannot be assessed at this time. At the same time, while it is hard to assess the true significance of these features it is likely that there has been some form of alteration or page substitution of page 4 of document Q1.
G9KWKK	The evidence provides very strong support for the proposition that the questioned document has been altered, however as a final step in the examination process, known transcripts from Central Square

TABLE 3

WebCode	Conclusions
	University in this time period should also be examined.
GGX9DC	The document corresponding a Center´s Square University - Official Transcript, the student name Susan Smith and the date issue 12/18/2024, IS ALTERED.
GQ6NJJ	On further examination I found that, ink jet printing process was observed on all four pages of questioned academic transcript (Item Q1 – Four page academic transcript provided by Susan Smith to the employer). However, there are some differences observed as follows: i) The 'pg. 4' showed different appearances observed from 'pg. 1' to 'pg. 3' when exposed to 254nm ultra violet light, 312nm ultra violet light and fluorescence light. ii) The 'pg. 4' showed different ink jet printing characteristics observed on from 'pg. 1' to 'pg. 3' when exposed to filter 925nm of flood light. iii) Upon magnification, ink scattered on the 'pg. 4' showed different characteristics from 'pg. 1' to 'pg. 3'. iv) The signature entry on 'pg. 4' was printed by the ink jet printing process. However, the signature entry on 'pg. 1' to 'pg. 3' was handwritten using black ink pen. Hence, I am opinion that, the questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) has been altered and indicates the page pg. 4 of questioned academic transcript (Item Q1 – Four-page academic transcript provided by Susan Smith to the employer) had been replaced.
GRZ7LK	Conclusion: The evidence supports the hypothesis page four was a fabrication based upon significant difference between that page and the preceding three. The analysis showed the signature on page four was not an original, "wet ink" signature. The printed text on page four was with toner technology in contrast to the ink jet technology used for the text on pages 1, 2, and three. Also, the optic brightness on page four displayed a brighter response to UV light than the other pages. The differences noted are not common to documents prepared in normal "course of business" document preparations.
GTB7ML	Differences were observed in the physical and optical properties of Transcript Page 4 compared to the remaining pages of the transcript, Transcript Page 1 - Page 3, using microscopic and optical techniques. This indicates support for the scenario that the questioned document has been changed/altered, via page substitution of either Pages 1-3 or Page 4. I am unable to comment on the scenario/s which have led to this substitution/change occurring.
H9FYMU	Item Q1 has been altered.
HC3JTX	Pages 1, 2 and 3 of the questioned document are made with an inkjet printer. No significant differences in the appearance of the printing between the pages was observed. Page 4 is also made with an inkjet printer. It was observed that the inkjet printing of the page 4 differs significantly when it was compared with pages 1, 2 and 3. Differences were observed in the appearance and the details of the printing. Moreover, the properties of the inkjet printing of page 4 differs from those of pages 1, 2 and 3 under IR light. The signatures on pages 1, 2 and 3 are made with a pen. The signature on page 4 is made with an inkjet printer. No significant differences in the appearance of the paper material between pages 1, 2 and 3 were observed. The appearance of the paper material of the page 4 differs significantly in comparison with pages 1, 2 and 3. Differences were observed in the properties of the paper under UV light and in the formation of the paper. The document has been altered by replacing the page 4.
HH8H4N	The findings revealed are consistent with a change or replacement of the last page (4) of the document examined.
HMHNG9	Based on the aforementioned observations, I came to the conclusion that the document in question has been altered.
HNAPKC	The results extremely strongly support that the questioned document has been altered.
HRATEJ	Based on the assumption that this document is supposed to have been printed using a single technology, and in a single print run, and that it should bear original ink signatures on each page, then the findings from the examination shows that the document was produced using two different printing technologies and therefore was not created as a contiguous document in a single print run. Further, the non-original toner signature on page four provides evidence that this document is not consistent with the

TABLE 3

WebCode	Conclusions
	expected official university transcript, and as such the document may not be genuine.
HYR93M	SOLE. - IT IS ALTERED the document “academic file” with student ID number 553249682 identified as Article “QD” by ADDITION AND DELETION regarding page 4. Document described on the body of this report regarding the technical reasons described herein.
JA7H77	There is conclusive evidence to indicate that the questioned document marked item ‘Q1’ particularly page 4 was altered and is not in original form as alleged by Ms. Smith.
JD8LV9	Based on the aforementioned observations, I came to the conclusion that the questioned academic transcript document has been altered
JFYMYB	Exhibit Q1 has been altered. Exhibit Q1-4 was not originally a part of Exhibits Q1-1, Q1-2 and Q1-3.
JGPNZT	Page 4 is inconsistent with pages 1-3 in terms of paper stock and background printing. The signatures on pages 1-3 are original while the signature on page 4 is a reproduction.
JHZTEG	I am informed that Susan Smith has submitted a four-page questioned academic transcript, item Q1, to her current employer stating that the document is the original transcript she received from her university. I found differences in the paper and the ink-jet printing between Page 4 and the other three pages. Further, whereas Pages 1, 2 and 3 bear original 'wet' ink signatures, I found that the signature on Page 4 is not an original signature but has been produced using an ink-jet printer and I consider that Page 4 is a reproduced document. Additionally, I note differences in the typestyle used for the text regarding the 'Degree Awarded...' on Page 4 compared with the surrounding text and differences in the size of the text associated with the signature compared with the surrounding text. Overall, my findings are such that, in my opinion, item Q1 is not the original transcript received from the university as it purports to be.
JL3QMN	Based on differences observed between Item 1 (Item Q1) pages 1 through 3 and page 4 using physical, alternate light source, and indented writing exams, it was determined that the Item 1 (Item Q1) document has been altered. In addition, the following observations were noted on Item 1 (Item Q1): Differences in the background color of "UNIVERSITY CENTER SQUARE" text were observed between pages 1 through 3 and page 4 Differences in alignments and measurements were observed between pages Differences in latent markings were observed using alternate light sources and electrostatic processing between pages 1 through 3 and page 4 The signatures on pages 1 through 3 are original and the signature on page 4 is non-original
JLM6F8	AFTER AN EXAMINATION AND COMPARISON OF PAGE 1 TO 3 AGAINST PAGE 4, THE FOLLOWING FINDINGS WERE MADE: 3.THE OFFICIAL TRANSCRIPT WAS ALTERED, BASED ON THE FOLLOWING OBSERVATIONS: 3.1 THE PRINTING PROCESS IS DIFFERENT. 3.2 THE PAPERS ARE DIFFERENT. 3.3 THE SIGNATURES ARE DIFFERENT. 3.4 THE ALIGNMENT AND LAYOUT ARE DIFFERENT.
JXGL69	The original document has been altered by replacing the “pg. 4”, which is identified as the alteration to the document.
K2DMLG	The documents analyzed, identified as Q1, DO present alterations regarding page number 4.
K6UYHX	Visual and microscopic examinations of Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)a were conducted. Visual examination of Exhibits Q1(1)b, Q1(2)b, Q1(3)b and Q1(4)b were conducted. Printing Process Examination: The questioned machine-generated entries on Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)a, including the questioned authorization signature, were prepared using liquid inkjet printing technology. The questioned machine-generated entries on Exhibit Q1(4)a were compared with the questioned machine-generated entries on Exhibits Q1(1)a, Q1(2)a and Q1(3)a. The questioned machine-generated entries on Exhibit Q1(4)a probably were not prepared by the same printer as the machine generated entries on Exhibits Q1(1)a, Q1(2)a and Q1(3)a; however, due to substrate differences and unknown printing mode utilized, the evidence falls short of that necessary to support a conclusive opinion. The questioned machine-generated entries on Exhibit Q1(1)a were compared with the questioned machine-generated entries on Exhibits Q1(2)a and Q1(3)a. The questioned

TABLE 3

WebCode	Conclusions
	machine-generated entries on Exhibit Q1(1)a were highly probably prepared by the same printer as the machine-generated entries on Exhibits Q1(2)a and Q1(3)a; however, due to a limited amount of characteristics for comparison, the evidence falls short of that necessary to support a conclusive opinion. No font differences were observed within the questioned machine-generated entries on Exhibits Q1(1)a, Q1(2)a, Q1(3)a, and Q1(4)a. Writing Ink Examination: The questioned verification initials on Exhibits Q1(1)a, Q1(2)a and Q1(3)a were prepared using black non-ball point ink. The questioned inked entries (initials) on Exhibit Q1(1)a were compared with the questioned inked entries (initials) on Exhibits Q1(2)a and Q1(3)a. No ink differences or alterations were observed within the inked entries. The inked entries on Exhibits Q1(1)a, Q1(2)a and Q1(3)a were not distinguishable at this non-destructive level of analysis. If chemical analysis of the inks is requested, the evidence should be sent to a laboratory that conducts destructive ink examinations. Paper Examination: The questioned paper within Exhibit Q1(4) was compared with the questioned paper within Exhibits Q1(1), Q1(2) and Q1(3). Differences in the properties (i.e., optical or spectral characteristics, density) of the paper within Exhibit Q1(4) were observed. The questioned paper within Exhibit Q1(4) does not originate from or share a common source with the questioned paper within Exhibits Q1(1), Q1(2) and Q1(3). The questioned paper within Exhibit Q1(1) originated from or shares a common source with the questioned paper within Exhibits Q1(2) and Q1(3); however, it should be noted that paper of this type is manufactured in mass quantity and is available to the average consumer. Indented Impression Examination: Electrostatic Detection Apparatus (ESDA) examination of Exhibits Q1(1)(a and b), Q1(2)(a and b), Q1(3)(a and b) and Q1(4)(a and b) was conducted. Indented handwriting and machine-created impressions were observed on Exhibits Q1(1)(a and b), Q1(2)b and Q1(3)b; however, some of the handwriting impressions on Exhibits Q1(1)b, Q1(2)b and Q1(3)b are not of evidentiary value. Indented machine-created impressions were observed on Exhibits Q1(2)a, Q1(3)a and Q1(4)(a and b); no further indented impressions were observed. Indentation lifts were created to preserve the results of the ESDA examination. Handwriting Examination: The questioned verification initials on Exhibits Q1(1)a, Q1(2)a and Q1(3)a and the questioned authorization signature on Exhibit Q1(4)a are suitable for comparison with submitted known initials and signatures. The ESDA indentation lifts were digitally preserved and processed. Exhibit Q1 was digitally preserved.
K7LTHM	SOLE. The questioned document Q1, identified as 350-2025-CLII-LDC-1, previously described in its corresponding section, by virtue of the characteristics found, is determined as an ALTERED DOCUMENT, due to interleaf addition.
KA76WJ	After careful examination and comparison of four page Academic Transcript (item Q1) using Video Spectral Comparator (VSC-8000, Software Version 7.2), it is concluded that the four page Academic Transcript (item Q1) has been altered.
KHEELX	From the analyses carried out, the expert is of the opinion that: - Sheets 1 and 3 come from the same production line and it cannot be ruled out that the sheet 2 comes from the same production line as sheets 1 and 3 . The sheet 4 comes from another production line. - The 4 sheets were printed in four-color inkjet. The inkjet inks used on sheets 1 to 3 are not different from each other, but they are different from those used on sheet 4. - The signatures are handwritten on sheets 1 to 3, but the signature on sheet 4 is printed. If the document is printed in one go by the university, the forensic findings provide extremely strong support that the questioned document has been altered rather than it has not been altered.
KJR7CT	There is evidence to support the document was altered.
KJTVMH	The questioned document has been altered.
KLEPGX	The first three pages of the submitted academic transcript contain consistent printing and paper characteristics to each other, and all contain original ink signatures. The fourth page is non-original, with the signature on it being reproduced using an inkjet printing process. It also differs in printing characteristics and paper stock from the first three pages of the transcript. Accordingly, it is not consistent with being the original fourth page of the transcript.

TABLE 3

WebCode	Conclusions
KMA9JY	The investigated document corresponding to the academic record submitted by Susan Smith, the page No. 4 presents a substitutional alteration in the transfer modality, the constituent elements, their characteristics do not faithfully correspond with the originals contained in pages No. 1, 2 and 3 of the document.
KV67B8	After an examination I came to the following conclusion: 6.1 “Q1.4” document is brighter as compared to that of “Q1.1”, “Q1.2” and “Q1.3” documents that are dull. 6.2 Signatures on “Q1.1”, “Q1.2” and “Q1.3” documents are original whereas for “Q1.4” it’s a copy. 6.3 Indentation of signature are present on of “Q1.1”, “Q1.2” and “Q1.3” but not on “Q1.4” document. This is due to the signatures being originals. 6.4 The distance between letter on “Q1.4” differ completely from that of “Q1.1”, “Q1.2” and “Q1.3” documents. 6.5 The background and writing printing on “Q1.4” is different to the printing on “Q1.1”, “Q1.2” and “Q1.3” documents. Thus the four page academic transcript was altered.
L8VLBT	It has been determined that the Exhibit Q1 pages 1 through 3 were produced with the aid of a full color office machine system that is different from the full color office machine system that was used to prepare the Exhibit Q1 page 4. Further the “Verified by” signatures appearing on the Exhibit Q1 pages 1 through 3 are ink signatures and the “Authorized By” signatures appearing on the Exhibit Q1 page 4 was prepared with a full color office machine system. It appears that the typographic information appearing on the Exhibit Q1 page 4 for the “Summer 2024” through the “End of Transcript” were added through some method of cut and paste.
LBQBTL	This report contains the results of the questioned document examinations. Results of Examinations: Alterations were detected within the Item 1 (Item Q1) document. Page 4 had optical variations within the ink and paper when compared to the remaining pages of the Item 1 (Item Q1) document. There were also inconsistencies in the quality and color of the ink utilized on page 4 and the remaining pages of the document. The signature on page 4 is non-original while the signatures on the remaining pages of the document are original signatures. Pages 1 through 3 (excluding the signatures) and the entirety of page 4 of Item 1 (Item Q1) were prepared using an inkjet printing technology. This technology is commonly found on numerous brands of printers and office machines. Pages 2 and 4 had inconsistencies with spacing and alignment as well as an incorrect year listed for the second Fall semester on Page 2. The Item 1 (Item Q1) signatures are too limited and not suitable for future signature comparisons. Additional observations and assessments have been made regarding the submitted item and recorded for possible future examinations.
LFB2H6	Modification of the original content by replacing page 4
LGHHEE	It has been concluded that the Four-page academic transcript, Exhibit Q1, has been altered.
LQ878W	Visual, microscopic and alternate light source examinations of Exhibits Q1(1)a through Q1(4)a were conducted. Visual examination of Exhibits Q1(1)b through Q1(4)b was conducted. Exhibits Q1(1) through Q1(4) were inter-compared. The results are as follows: Printing Process Examination The questioned machine-generated entries on Exhibits Q1(1)a through Q1(4)a were produced with liquid inkjet printing technology; however, the questioned machine-generated entries on Exhibit Q1(4)a were not prepared by the same printer as on Exhibits Q1(1)a through Q1(3)a. Ink Examination The questioned signatures on Exhibits Q1(1)a through Q1(3)a were prepared using a black non-ball point ink; whereas, the questioned signature on Exhibit Q1(4)a was produced with liquid inkjet printing technology. Indented Impression Examination Electrostatic Detection Apparatus (ESDA) examination of Exhibits Q1(1)(a and b) through Q1(4)(a and b) was conducted. Indented handwriting and machine-created impressions were observed on Exhibits Q1(1)b, Q1(2)b and Q1(3)b; however, the handwritten indented impressions are not of evidentiary value. Machine-created indented impressions were observed on Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)(a and b). No further indented impressions were observed on Exhibits Q1(1)a, Q1(2)a, Q1(3)a and Q1(4)(a and b). Indentation lifts were created to preserve the results of the ESDA examination. Therefore, due to the results above, characteristics of an alteration were observed within Exhibit Q1.

TABLE 3

WebCode	Conclusions
LR3PD4	In light of the observation mentioned, I reached the conclusion that the four-page academic transcript was altered.
LU7KUL	Alterations were detected to the four-page Item 1 (Item Q1) document based on the following inconsistencies: • The signatures on pages one through three are original inked writing while the signature on page four was prepared by an inkjet process. • The text and interior lines on pages one through three were prepared using black inkjet ink while all the black portions on page four were prepared using a fortified inkjet process (employing cyan, magenta, yellow, and black). • When exposed to alternate light sources, the page 4 paper exhibited different optical properties from pages one through three. • The signatures on pages one through three are in the same region on the right sides of the documents and use the same "Verified by:" verbiage while the signature on page 4 is at the bottom of the document and uses the verbiage "Authorized By:". No indented writing was observed during the examinations of Item 1 (Item Q1) pages 1 through 4 using oblique lighting and the Electrostatic Detection Apparatus (ESDA). No watermarks were observed on Item 1 (Item Q1) pages 1 through 4 using transmitted lighting that might indicate their immediate source(s).
M3VTU3	In light of the abovementioned observations I reached the conclusion that fraud has been committed on the questioned academic transcripts.
M7GCY8	The academic record dated December 18, 2024, in the name of Susan Smith is altered.
M8NUVG	SOLE. – IT DOES SHOW ALTERATION BY SUBSTITUTION AND ADDITION on page number "4" the academic bachelor's degree file under the name of Susan smith, issued by Center Square University. The above is due to technical reasons herein expressed.
MNWLZ8	Based on the observations, the transcript has been altered by substitution. It is likely that the fourth page is the original on, while the first three pages are substituted pages that were inserted in place of the original first three pages.
MT9RFE	In conclusion, the significant differences in signature characteristics, printing properties, paper margins, and ink solubility collectively indicate that page 4 was altered or replaced, and is not consistent with the rest of the document in origin or production.
MXKEAJ	Four-page academic transcript provided by Susan Smith to the employer has been altered by substituting of page nr.4.
MYVGY3	The Questioned Document presented is a fraudulent document. Page 4 shows possible signs of an altered or substituted document.
NBLDVU	Findings Methods Visual examination and comparison of item Q1 was completed. A hand lens and microscope were used for the examination. In addition, item Q1 was examined instrumentally with various light sources. Conclusions The paper, printer ink, and pen ink are consistent on pages 1, 2 and 3 of item Q1. They could not be differentiated by examination using various light sources. (Inconclusive) The paper and printer ink on page 4 could be differentiated from pages 1, 2, and 3 of item Q1 by examination with various light sources. (Source Exclusion) The signatures on pages 1, 2 and 3 of item Q1 were written with original pen ink. The signature on page 4 of item Q1 was not. (Source Exclusion) The document in item Q1 was altered from its original version. Remarks All items are available for return.
NFKRJK	Alterations May Have Been Detected It is determined that the Item 1 document may have been altered due to the observation of text misalignment, inconsistencies in optical properties of the ink, difference in wordage, and missing information in sections. However, due to the lack of a standard for comparison, it cannot be determined if the observations are intentional or not.
NGR8RB	There a number of significant differences between pages one to three of the questioned document, and page four of the questioned document. The nature of the differences, are such that in our opinion, the document has been altered, with page four of the document being produced at a different time to pages one to three. Additionally, there is a non original signature on page four, whereas pages one to

TABLE 3

WebCode	Conclusions
	three bear 'wet ink' signatures, which indicates that they were not signed at the same time.
NT726P	The results of the ESDA examinations were indentations/embossments observed on the back of page 3, lower left quadrant. The results of the VSC examination using IR Reflectance and IR Luminescence were on pages 1 - 3, initials dropped out; pages 1 - 3 both initials and paper fibers fluoresced, page 4 only paper fibers fluoresced.
P9T2CF	The questioned document HAS BEEN ALTERED.
P9XJAE	"In my opinion, Pages 1-3 of Q1 show closely similar methods of production and each bears an original ink signature in similar black ink. However, I find that Page 4 of Q1 differs from Pages 1-3 of Q1 in many respects. In my opinion Page 4 of Q1 is made from different paper compared to Pages 1-3 of Q1. Also, in my opinion, Page 4 is not an original page with an original signature but rather a copy-based image of an original page(s). This includes a copy rather than original pen ink signature on Page 4. Therefore, in my opinion, Q1 is not a single original document, as claimed by Susan Smith, but has been altered by substituting Page 4 with a copy-based version. Additionally, I have observed that the text line ""Degree Awarded: Bachelor of Science December 13, 2024"" on Page 4 of Q1 shows differences in character spacing (characters are closer together) compared to surrounding text. I also find that the exact shape of characters in this line of text (""Degree Awarded: Bachelor of Science December 13, 2024"") differ when compared to equivalent characters elsewhere on Page 4 (and Q1 generally) although, visually, they are very similar. Without access to genuine examples of Academic Transcripts of the same design with comparable text, it is not possible to rule out the possibility that a font(s) with different character shapes and with different character spacing is used for the equivalent text (i.e. equivalent to ""Degree Awarded: Bachelor of Science December 13, 2024"") in a genuine document. However, this explanation appears intrinsically unlikely. Therefore, I consider it likely that the line of text ""Degree Awarded: Bachelor of Science December 13, 2024"" shown on Page 4 of Q1 (or parts of it) has been added to the document as a separate editing event(s). The submission of reference examples of genuine Academic Transcripts of the same design with the same or similar wording would add weight to the comparisons and may allow definitive opinions regarding the nature of Q1 to be determined."
PCU62G	In order to respond to the request, a preliminary inspection of the elements under study - EMP and EF - was carried out, in order to verify compliance with the suitability requirement established in the protocol "INSPECTION OF ALTERATIONS IN PRINTED AND HANDWRITTEN DOCUMENTS" of the FGN for this type of study, evidencing that the four (04) pages (academic record provided by Mrs. Susan Smith) are in Original; therefore, they are suitable to proceed with the inspection of Alterations in Printed Documents. Subsequently, through the use of magnifying glasses of different magnifications and video spectral comparator equipment, which allowed the exposure of the documents of doubt, under visible light with incidental angle, as well as different wavelengths of the Ultraviolet spectrum, in order to identify by means of physical luminescence phenomena the characteristics or elements that evidence the alteration, where it can be seen that the doubted document (four (04) pages of academic record provided by Mrs. Susan Smith), shows discrepant characteristics on folio 4 in terms of its printing system, caliber of the letters and chromatic tonality; Similarly, it can be seen that the signature on folio 4 is printed; while signatures present on folios 1, 2 and 3 are found in original. According to the study, the following elements were determined for inspection:
PEHED4	El documento cuestionado ha sido alterado mediante la sustitucion de la hoja 4. [Translation by CTS: The questioned document has been altered by replacing page 4.]
PL68MH	the questioned document has been altered
PMDGEE	The paper and method of production of page 4 of the transcript differs from that of pages 1, 2 and 3. Pages 1, 2 and 3 have similar paper to each other and the same method of production as each other. Assuming all four pages in a transcript would have been produced in one sitting in a genuine document, then as page 4 differs from pages 1-3, in my opinion the transcript has been altered and page 4 substituted.

TABLE 3

WebCode	Conclusions
PQDRBE	The fourth page of the document has been altered as the signature on it is not originally executed, the printing of the contents of the page have a different source/printer than that of the previous 3 pages. According to the Official German Scale, the conclusion is stated with a probability bordering on certainty as the entire configuration of findings compiled, discussed and assessed as having high evidential value is in complete conformity with the hypothesis in all respects.
PW43KD	Following the examination of the four-page questioned transcript (Q1) using the aforementioned methods, no evidence of overwriting, added printed text, chemical erasures, text tampering, or inconsistencies in printing quality was detected. Infrared and ultraviolet light examinations revealed no signs of post-production modifications, and the document appeared free of any physical alterations. However, the overall printing characteristics of Q1—specifically the presence of CMYK dot patterns across all pages—are indicative of photocopy reproduction. Despite this, magnified analysis confirmed that the signatures present on the document were handwritten and not reproduced or mechanically printed. It is important to note that the questioned transcript lacks the standard security features typically found in official academic transcripts, such as watermarks, microprinting, UV-reactive elements, and anti-copy design elements. Due to the absence of a known specimen for comparison—both in terms of the official print layout and the authorized signature of the issuing personnel—we cannot conclusively determine whether Q1 is genuine or altered. Such a comparison is essential to confirm whether the transcript was issued by an authorized source. Based on the observations outlined above, it is concluded that the questioned transcript (Q1) has probably been altered. However, this conclusion remains provisional until a verified known specimen is provided for definitive comparison.
Q2CM7P	In my opinion the four page questioned transcript document has been altered by substituting or replacing the original page 4.
QALCL9	The first three pages of the 4-page academic transcript (“pg. 1 – pg. 3”) have the same paper weight per square meter, the same cross-sectional view, the same color under UV light, and the same IR luminescence properties. In these parameters the fourth page (“pg. 4”) is different from the first three pages. The printed graphic elements of the first three pages (“pg. 1 – pg. 3”) were produced using color inkjet printing: the background print and logo, the headline text, the border line and the page numbering are displayed using magenta, cyan and yellow components of the used printer and the issued data content is created using the printer’s black ink. This suggests that the pages were produced by the same printer in a single printing step. On all three pages (“pg. 1 – pg. 3”) a natural handwritten signature appears, written with a ballpoint pen containing black ink (a writing impression can be seen in oblique light, the optical behavior of the ink of the signatures is the same on the three pages). The complete graphic material of the “pg. 4” page – including the authenticating signature – was printed using color inkjet printer, but the print quality is different from the first three pages: the background text is less legible, the color tone of the headline text and the logo is different, and the line thickness of the letters and numbers forming the text parts is slightly larger. However, in this case, all the color components of the printer were used to display the issued data, which appears to be black. Due to the fact that the signature is printed, this page cannot be part of the original document. In the text line “Degree Awarded: Bachelor of Science December 13, 2024” on page 4, the distance between the letters in the phraze “of Science” is different from that observed in the case of the same word combination occurring in two places on the same page, therefore they cannot be made to coincide with each other. This circumstance suggests that the indicated text line could not have been part of the original document, i.e. the result of manipulation. Overall, the last page (“pg. 4”) of the four-page document is not part of the academic transcript officially issued by the educational institution, nor can it be a direct copy of it. The “pg. 4” bears signs of manipulation for the reasons indicated, i.e. the document has been altered.
QCANNY	For the purpose of this test, the four page academic transcript was viewed as one questioned document, and not four separate documents. In the scenario where the [Laboratory] laboratory has credible and relevant reference material related to the academic transcript, the questioned document would be given the strongest negative conclusion. The unofficial translation from the laboratory's conclusion scale would therefore be: - 4. The document is in all probability forged. The [Laboratory] laboratory's conclusion scale is based on probability. Therefore, in a scenario where the laboratory has little or no reference

TABLE 3

WebCode	Conclusions
	material regarding the institution or the type of document, the laboratory would take into account a certain probability for alternative scenarios. The questioned document would be given a weaker negative conlusion. The unofficial translation of which would: -2. The document is probably forged.
QM8MBY	In my opinion, page 4 shows a number of differences to the proceeding pages which would indicate that the 4 pages were produced at the same time. These differences include (1) differences in the printer used, pages 1 - 3 v 4. For example, the background printing on page 4 is not as clear; sharp as the printing on the previous pages. (2) differences in the paper used, pages 1 - 3 v 4. (3) the signture on page 4 is not original, but a copy.
QMVP4A	Item Q1 was altered. Page 4 was substituted.
QRPR6N	The items listed in this Certificate of Analysis were assessed and examined based on the methodology described in the Forensic Document Unit (FDU) Test Methods (unless otherwise noted). The methodology used included macroscopic, microscopic, paper, printing process, ink, and indented impressions examinations, as well as a font classification and handwriting assessment. The laboratory request called for an examination of a four-page academic transcript for alterations. Macroscopic and Microscopic Examination Paper: The documents in Pages 1-4 in Item Q1 were printed on white sheets of paper. Pages 1-3 measured approximately 8 ½" in width by 11" in length, while Page 4 measured approximately 8 ½" in width by 10 15/16" in length. Pages 1-4 in Item Q1 were assessed for paper fiber distribution with transmitted lighting and optical brightness with ultra-violet lighting. Pages 1-3 in Item Q1 reacted similarly to these alternate light sources. In contrast, when compared to Pages 1-3 in Item Q1, Page 4 in Item Q1 was denser in paper fiber distribution and more vivid in optical brightness. Additionally, when viewed under fluorescent lighting, the reactive fibers in Pages 1-3 in Item Q1 appeared similar in size and shape. However, the reactive fibers in Page 4 in Item Q1 appeared smaller in size and shape than the fluorescing fibers in Pages 1-3 in Item Q1. Print Process: Pages 1-4 in Item Q1 were printed from multi-color ink jet print process(es). However, the print process in Page 4 of Item Q1 differed in quality, clarity, color, and reaction to alternate light sources. Ink: The stylized signatures in Pages 1-3 in Item Q1 were executed with black, non-ballpoint ink, while the stylized signature in Page 4 in Item Q1 was a non-original signature, printed with a multi-color ink jet printer. The ink signatures in Pages 1-3 in Item Q1 reacted similarly under alternate light sources. Indented Impressions Examination Pages 1-4 in Item Q1 were processed for indented impressions. Indented impressions are generally impressions left on a document due to having been in contact with another document during the writing process. When deciphered, indented impressions may be subject to more than one interpretation. Eight (8) electrostatic detection device (EDD) lifts, individually marked as Q1A1-Q1A8, were created from the front and reverse of Pages 1-4 in Item Q1, respectively. The EDD lifts can be viewed in Item Q1A. No unsourced indented impressions were observed on EDD lifts Q1A1-Q1A8 in Item Q1A. Font Classification Using reference materials available within the FDU, a font search was conducted on the font on Pages 1-4 in Item Q1. The font on all four (4) pages were similar in size, class characteristics, and most closely correlated to "Lucida Sans Typewriter" and other similar fonts. The classification was limited due to the lack of a complete character set of the font on Pages 1-4 in Item Q1. Additionally, the text, "Degree Awarded: Bachelor of Science December 13, 2024" on Page 4 in Item Q1 contained narrow intra-word spacing. The spacing between the characters within this line was narrower than the intra-word spacing on the rest of the text on Page 4, as well as the text on Pages 1-3 in Item Q1. Therefore, this evidence suggests that the text, "Degree Awarded: Bachelor of Science December 13, 2024" may have been an insertion on Page 4 in Item Q1. Handwriting Assessment Pages 1-4 in Item Q1 contained stylized signatures. The signatures in Pages 1-3 in Item Q1 were original signatures executed in black, non-ballpoint ink. The signature depicted in Page 4 in Item Q1 was a non-original signature, printed with a multi-color ink jet print process. The assessment of a non-original signature was a limitation to the handwriting assessment because features such as naturalness, line quality, and speed cannot be fully assessed. The stylized signatures in Pages 1-4 in Item Q1 are suitable for a handwriting comparison, with limitations. Opinion Based on the examination of Pages 1-4 in Item Q1, the evidence suggested the four-page document had been altered by a substitution of Page 4 in Item Q1.
QRQGFC	The document referred to as OFFICIAL TRANSCRIPT issued on 12/18/2024 to Susan Smith has an

TABLE 3

WebCode	Conclusions
	ALTERATION BY SUBSTITUTION on page 4.
QTW8EE	The document has been forged by replacing whole card with page 4, which was prepared entirely as a printout on an inkjet printer on different paper.
R7EDNK	Indentations/ embossments were detected on the back of pages 1, 2, and 3 in area approximately behind the "Verified by:" line on the front of the pages. A total of 8 ESDA lifts were generated. The entries on the "Verified by:" line of pages 1, 2, and 3 drop out while the entry on the "Authorized By:" line does not when examined with infrared reflectance techniques. The entries on the "Verified by:" line of pages 1, 2, and 3 fluoresce while the entry on the "Authorized By:" line does not when examined with infrared luminescence techniques. A total of 18 images were captured utilizing the Vide Spectral Comparator (VSC). An additional 5 images were captured utilizing the Vide Spectral Comparator (VSC) to document potential evidentiary features that do not fall under the above-mentioned categories of examination.
R96FRN	Based on visual and instrumental examinations of Exhibits 33-1 through 33-4 for alteration, it was determined Exhibit 33 was altered via a page substitution based on the following observations: • The signature on Exhibits 33-1 through 33-3 was handwritten with a black aqueous non-ballpoint pen, which share similar optical properties. • The signature on Exhibit 33-4 is non-original produced with inkjet technology. • The inkjet printed areas on Exhibits 33-1 through 33-3 share similar visual and optical properties and deposition; while the inkjet printing on Exhibit 33-4 has dissimilar visual and optical properties and deposition. • The paper used for Exhibits 33-1 through 33-3 has different optical properties than the paper of Exhibit 33-4.
RBTRTE	the signature on page 4 of the transcript is not a wet signature, but was created using a computer and its equipment, and as previously stated, page 4 differs from the other pages.
RDZAPP	1. No indentations were detected on document Q-1 using the above listed methods. 2. POSSIBLE ALTERATION (PAGE SUBSTITUTION): Examination of document Q-1 has revealed evidence of possible alteration by page substitution. While pages 1, 2, and 3 of document Q-1 share similar paper characteristics, both visually and fluorescently, page 4 of document Q-1 has different visual and fluorescent paper characteristics. Additionally, the features of page 4, including the college name header, the outline border surrounding the page, and page number at the bottom left corner of the page, do not correctly align with pages 1, 2, and 3 when the pages are placed in the same orientation. This conclusion is limited, as no known genuine transcript was submitted for comparison with the questioned document at this time. Should the investigator be able to obtain a genuine transcript from Center Square University, a more conclusive conclusion may be reached regarding the authenticity of this questioned document Q-1.
RHV3MQ	The investigated document presents a substitutional alteration by insertion of page 4.
RJ67DV	Results of Examinations: Alterations were detected It was determined Item 1 (Item Q1) was altered due to the following observations: · Pages 1 through 3 of Item 1 (Q1) was prepared using an inkjet printing process with original inked signatures and page 4 of Item 1 (Q1) was prepared using an inkjet printing process in its entirety (including the signature). · Page 4 of Item 1 (Q1) exhibits different reflective properties and different print quality than pages 1 through 3. · Page 2 of Item 1 (Q1) exhibits inconsistent spacing and alignment for the "Summer 2022" and "Fall 2023" sections. No indented writing was observed on Item 1 using side lighting and electrostatic processing. The signatures on Item 1 (Item Q1) are limited in quantity and complexity and are therefore unlikely to be identified or eliminated through handwriting comparisons. However, if future signature comparisons are desired, dictated and undictated known signatures should be obtained from any logical suspect(s). The known signatures should be comparable to the questioned signatures in style, wording and format. Dictated known signatures should be obtained on separate pages similar to the questioned item. Numerous repetitions may be necessary in order to obtain naturally prepared signatures, and each repetition should be removed from the writer's view upon completion. Undictated known signatures are those prepared during normal course of business activity. Possible sources of undictated known signatures include business papers, letters, canceled checks, and/or applications. Additional assessments and observations

TABLE 3

WebCode	Conclusions
	have been made regarding the submitted items and recorded for possible future comparisons.
RQP7T9	The characteristics on Page 4 is different form the Page 1, Page 2 and page 3. Hence, I am of the opinion that the Questioned document of "Official Transcript" has been altered.
RU89ZD	SOLE. – It is altered by elimination and addition the document called "OFFICIAL TRANSCRIPT". The above due to the technical reasons described on the body of this study.
RZBA28	1. The signatures on pages 1, 2 and 3 were handwritten. However, the signature on page 4 was not handwritten but instead was a printed signature consistent with being printed using an ink jet printing process. 2. The page 4 of the academic transcript showed differences in paper and printing characteristics from the pages 1, 2 and 3 of the academic transcript. Hence, I am of the opinion that the page 4 has been fraudulently modified and the questioned academic transcript has been altered.
T3ZZLC	Sole conclusion: the academic transcript of four pages in the name of Susan Smith dated 12/18/2024 with letterhead Center Square University - Centerlande, Ohio, has been altered by the deletion and addition of page 4, document identified as exhibit "05" and described in the corresponding section.
TEDXT2	Based on the examination and comparison of the examined material, the following conclusion was reached: The academic transcript described as Item Q1 has been altered. It bears evidence of being printed with different printers and has both original, written-ink-on-paper signatures and printed signatures, both of which are consistent with a page substitution. Furthermore, the listed grades in the Summer 2022 semester do not compute to the listed GPA, nor do the cumulative grades compute to the overall GPA.
TFJNTP	The questioned paper, machine-generated entries, and indented impressions in Exhibits Q1(1) through Q1(4) were intercompared. The results are as follows: Differences were observed in the paper and ink used in the production of Exhibits Q1(1)(a and b) through Q1(3)(a and b) and the paper and ink used in the production of Exhibits Q1(4)(a and b). The indented machine-created impressions observed on Exhibits Q1(1)(a and b) through Q1(3)(a and b) are of a different type and design as the indented machine-created impressions observed on Exhibits Q1(4)(a and b). Therefore, the questioned paper and machine-generated entries within Exhibits Q1(1) through Q1(3) do not originate from or share a common source with the questioned paper and machine-generated entries in Exhibit Q1(4).
TRGLHB	The questioned document has been altered.
TRYFJK	The questioned transcript, Exhibit 1(1-4) was altered.
TWWWXY	In light of the abovementioned observations, I reached a conclusion that the academic transcript marked Q1 has been altered
TYW63A	There were four pages to the questioned document which is an academic transcript. Page 4 of the questioned document is not consistent with pages 1-3 of the academic transcript. Some of the differences between page 4 of the questioned document, and collectively pages 1-3 are: 1) Page 4 contained printing that is of a different color {ie: the repetitive watermark and the maroon at the top of the page, and the colors of peach and gray in the university seal}. 2) The rectangle border on page 4 was not consistent with the rectangle border on pages 1-3 of the questioned document. 3) The "Authorized by" signature on page 3 was printed with a laser printer...was not a hand-signed, wet-ink signature as seen in the signatures located on pages 1-3. Since page 4 of the questioned document was not similar to how pages 1-3 were produced, it is my opinion that page 4 was not (is ELIMINATED) as being manufactured in the same manner that pages 1-3 were created.
TZRN4B	Basic on Infrared light , Ultraviolet light and Macro/Micro exmination , PAGE4 of this academic transcript is different from PAGE1, PAGE2 and PAGE3 . The question documents has been altered , page4 wasn't the originated academic transcript .
U3DU2D	The 4-page Q1 document has an Additive alteration on the entire page 4.

TABLE 3

WebCode	Conclusions
U8DY6B	Page4 is different from page1 to page3 in paper, printing characteristics and printing materials components. In addition, the signature on page4 is printed by a color inkjet printer which differs from those on page1 to page3.Therefore, the questioned document has been altered.
U8PXPU	Based on the examination, it was found that page 4 of the academic transcript differs significantly from pages 1 to 3 in several aspects, including paper color, paper size, UV fluorescence, and the printer used. In addition, the signatures on pages 1 to 3 were written in pen ink, while the signature on page 4 was printed. Therefore, it is concluded that page 4 of the academic transcript was substituted.
UAQZFV	4th page (sheet of paper) of the questioned document has been altered.
UE89YN	1. Visual, microscopic and VSC (Video Spectral Comparator) examination of Laboratory item #1 (Q1), revealed the following: a. While all four pages of Q1 are produced utilizing a color inkjet process, differences were found to exist between the printed material on pages 1 through 3 when compared to page 4, including differences of yellow half tone density, degree of smoothness in the font, and differences in optical properties of the inks. See pages 3 through 6 of this report as a representation of the inconsistencies found. b. The signature present on Q1 page 4 is a reproduced inkjet-printed signature and not a wet ink, original signature. In comparison, the three signatures present on Q1 pages 1 through 3 are original, wet ink signatures. c. Differences were found to exist between the paper substrate of Q1 pages 1 through 3 when compared to Q1 page 4 with regards to their Ultra-Violet fluorescence. Q1 page 4, exhibited a bright fluorescence response compared to Q1 page 1 through page 3, which exhibited a dull response when examined under short and long UV wavelength. 2. Laboratory item #1, Invoice #Q201202 was examined utilizing oblique/side lighting and EDD (Electrostatic Detection Device) for the possible presence of indented impressions. Aside from the laboratory number, lab item number, envelope outline, paper outline, or extraneous markings - no indented impressions were found on Q1. However, impressions of the printed material including the logo were found on Q1 page 4, which were different than the ones on Q1 pages 1 through 3. See report pages 7 and 8 as a representation of the impressions found. 3. Utilizing the VSC (Video Spectral Comparator), EDD (Electrostatic Detection Device), visual and microscopic examination revealed that the Q1, 4-page document was altered in the following manner: page substitution (Page 4)
UFH8VJ	Indentations/embossments were observed on the front of page 4 and back sides of pages 1, 2, 3. Inks in the signatures dropped out on pages 1, 2, 3. Paper fibers fluoresced on pages 1, 2, 3, 4. More paper fibers fluoresced on page 4 than on pages 1, 2, 3.
UH6R2M	Microscopic and optical examination of the four-page of the item Q1 revealed that page 4 has different characteristics from pages 1-3, supporting the hypothesis that the page 4 has been altered.
UKWLZC	The document under inspection (Susan Smith's academic record) has been altered on the fourth folio, in the substitute form; however, it was not possible to establish the original text.
UW3YVH	The results of indentations/embossments examinations consisting of oblique lighting and ESDA processing were as follows: Indentations/embossments were observed on the back of pages 1 through 3 in the lower left quadrant. Indentations/embossments were observed on the back of page 4 at the bottom of the page. Total of 8 ESDA lifts generated and retained. The results of VSC examinations consisting of IR Reflectance and IR Luminescence techniques were as follows: Inks in the signature area appeared lighter on pages 1 through 3; no significant observations on page 4. Inks in the signature area and paper fibers fluoresced on pages 1 through 3; paper fibers fluoresced on page 4. Total of 12 VSC photo files generated and retained; 3 additional VSC photo files were captured and retained to depict evidentiary observations that do not fall under the above mentioned techniques but may be used for investigative purposes.
UW4N78	The document in question has been altered.
UXHXE8	The questioned document has been altered. It has been forgered by replacing 4th page of the document.

TABLE 3

WebCode	Conclusions
V6CPZ7	The results of the investigations show that the question document has been altered. There were no limitations to the investigation. Our expert opinion is that the questioned document has been altered. The sheet number 4 was replaced with a different one.
VD9KVJ	The source of Page 4 from Item 1 has been eliminated as being from the same source used to produce Pages 1 through 3 of Item 1. No unidentified indented impressions were recovered from pages 1 through 4 of Item 1. Two (2) ESDA lift sheets were created from the front and back each page of Item 1 and were made sub-items 1.1 and 1.2 for page 1, 1.3 and 1.4 for page 2, 1.5 and 1.6 for page 3 and 1.7 and 1.8 for page 4. The transparent plastic-like lifts used to recover the indentations are being returned to you in evidence container # 1. The lifts should be retained as evidence.
VJX3CF	In my opinion, the evidence provides very strong support for proposition P1 (The questioned 4-page academic transcript has been altered) over proposition P2 (The questioned 4-page academic transcript has not been altered).
VLJLGK	Examination of Item 1 (Q1) has identified that Item 1.4 (page 4) was produced using different methodologies and paper than that which produced Items 1.1 (page 1), 1.2 (page 2) and 1.3 (page 3). Items 1.1-1.4 (pages 1-4) were all processed for indented impressions with no decipherable indented impressions recovered. An ESDA lift sheet was created from each Item and made sub-items 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.3.1,1.3.2, 1.4.1 and 1.4.2. The transparent plastic-like lifts used to recover the indentations are being returned to you in evidence container #A. The lifts should be retained as evidence.
VME6JL	Alteration Examination Item Q1, comprising a four-page official transcript from Center Square University, was examined for evidence of alterations through various microscopic, digital, infrared, ultraviolet and indented writing examinations. These examinations revealed the following: Item Q1.4 (page 4) was printed on different paper than Items Q1.1-Q1.3 (pages 1 through 3); Items Q1.1-Q1.3 each contained an original inked signature whereas Item Q1.4 contained a non-original signature that was machine printed. In addition, it was also observed that the machine printing on Q1.1 through Q1.3 appears sharper/more distinct than the printing on Q1.4. Therefore, it is my opinion that the questioned transcript was probably altered by means of page substitution of Item Q1.4 (page 4) of the record. However, the absence of a known official transcript from Center Square University for comparison, combined with insufficient information regarding the institution's transcript production methods, hindered the examination and precludes a more conclusive opinion. See supporting examinations below: Printing Process Examination: Items Q1.1-Q1.4 were examined both visually and microscopically. These examinations revealed that the machine printing on the questioned pages was produced using an ink jet printing process. However, it was observed that the machine printing on Q1.1-Q1.3 (pages 1 through 3) appeared sharper/more distinct than the machine printing on Q1.4 (page 4). Paper Examination Various microscopic, infrared, and ultraviolet examinations were performed on the questioned documents. These examinations revealed the following: The questioned sheets of paper, Items Q1.1-Q1.4, were examined with no visible watermarks observed. Items Q1.1 (page 1) through Item Q1.3 (page 3) exhibit similar class characteristics, such as size, color, and response to ultraviolet and infrared light sources indicating they may share a common source. However, it should be noted that paper of this type is produced in mass quantity and is available to the average consumer and should not be construed as a definitive identification. Item Q1.4 (page 4) and Items Q1.1 through Q1.3 (pages 1 through 3) disagree in class characteristics, such as color (hues), and their response to transmitted, ultraviolet and infrared light sources. Therefore, it is my opinion that Item Q1.4 is printed on different paper than Items Q1.1-Q1.3. Alignment/Font Examination: The alignment of the machine printing on Items Q1.1 through Q1.4 was examined using digital imagining techniques. The four pages were digitally overlaid, along with a digital image grid, to examine the font, horizontal and vertical alignment, and spacing of the text within each page and between pages. Theses examinations revealed that overall, the spacing, margin and baseline usage of the printed text appears to be in expected alignment within each page and also between pages. In addition, similar sans-serif and serif fonts were used to produce the printed text on all four pages. Indentation Examination: The questioned documents, Items Q1.1-Q1.4, were examined for the presence of any indented writing, typing, or other identifying impressions. These are impressions sometimes left on paper from writing, typing, or other markings

TABLE 3

WebCode	Conclusions
	done on another page while it was superimposed over the questioned material. No meaningful impressions were recovered in the questioned documents.
VMY743	The document is altered. Page 4 was not printed on the same machine as pages 1 thru 3. Page 4 was printed with a different paper, different print process, and does not contain an original wet ink signature. Page 4 was inserted and the four-page document is altered/fabricated.
VQXGY3	PURPOSE OF EXAMINATION Determine whether or not Exhibit 001-001 has been altered. RESULTS AND CONCLUSIONS Forensic, comparative examinations using magnification and specialized lighting revealed that Exhibit 001-001 has been altered. This finding has been made evident by differences observed in the optical properties, formatting and print quality of page 4 when compared to pages 1,2 and 3. Additionally, the signature appearing on page four is not original and was produced using inkjet while the signatures on pages 1 through 3 are original. These observations support the finding that Exhibit 001-001 has been altered and consistent with the claims of the employer.
VXVA8W	I came to the conclusion that the exhibit in question (academic transcript) was altered.
VZLBBY	The 4th page of academic transcript is a forged document.
W2X6V7	The document does show alterations.
WBHJRG	Q1d bears black text produced with a different printing process (4-color inkjet) than Q1a, Q1b, and Q1c (black only inkjet). Q1d shows visible dissimilarity from Q1a, Q1b, and Q1c when exposed to UV (ultra-violet) light (including 365nm, 312nm, and 254nm). Q1d bears a signature that was produced by 4-color inkjet rather than the liquid/gel ink that was used on Q1a, Q1b, and Q1c. Q1d contains more IR (infrared) reactive fibers than Q1a, Q1b, and Q1c. Similar paper feed-roller marks developed on the back sides of Q1a, Q1b, and Q1c using the ESDA2 but did not develop on Q1d. These dissimilarities are evidence that Q1 has probably been altered by page substitution of Q1d.
WD6HL6	Page 4 of the questioned document was printed using a different printing system than the one used to print pages 1, 2 and 3.
WMRDPR	The questioned document has been altered by substitute of the fourth page.
WTGV33	Based on our examination, the questioned document Q1 has been altered.
WYLUET	El documento cuestionado señalado como Q1, si se encuentra alterado. [Requested translation was not provided by the time of publication.]
X3L3H3	The results strongly supports that page 4 has been alterd.
X7GUNE	The questioned document was examined for alterations. The questioned document was altered as evidenced by the following: • The questioned document was examined for marking or writing impressions. The back side of pages 1-3 had a rectangular marking impression and page 4 did not. • The page 4 sheet of paper appeared slightly brighter than the other pages under ultraviolet source. • Pages 1-3 bears a signature produced with a writing instrument and page 4 was produced with an inkjet printing process machine. • The color printing on page 4 had a warmer yellowish hue overall vs. pages 1-3 had a cooler bluish hue. There is more black ink in the printing of “Center Square University” of page 4 vs. pages 1-3. • The alignment of the printing on page 4 is slightly higher than the other 3 pages.
XC8ADL	According to the analyses carried out, the dubious material used for this study and the technical reasoning set forth above, it is established that the document "Center Square University Centerlande, Ohio - OFFICIAL TRANSCRIPT", with an issue date of "12/18/2024", in the name of "Susan Smith", consisting of four pages called "pg.1", "pg.2", "pg.3" and "pg.4", PRESENTS ALTERATION on page 4.

TABLE 3

WebCode	Conclusions
XG4TG6	[No Conclusions Reported.]
XKHQM8	IT DOES SHOW ALTERATION the “academic transcript” under the name of Susan Smith, with ID number 553249682 by addition – deletion on page four, according to the stated on the body of this expert’s report.
XLXVJJ	The differences found between pages 1 to 3 and page 4 show that the original page 4 of the ‘Centre Square University’ diploma has been replaced by a page produced at a later date.
XV3ZBZ	A page 4 of the document must be altered.
XYJ3H7	The document was altered by change the last page
Y4NKU4	The fourth page of the transcript has been produced on a printer different from that used to print the first three pages. The signature present on the fourth page was not written on that page but is part of the printed image. Each of the first three pages of the transcript bears a handwritten signature made with a ball-pen. I assume that the pages of a genuine transcript would be printed consecutively on one machine and then signed by the appropriate individual. I consider that the ways in which the production of the fourth page differs from the production of the first three pages show that the fourth page was not part of the original transcript but is a substitute for the original fourth page.
YBAFV8	This means that the background, execution, and signature of the document on page 4 are on the same printing plane. the background print on page 4 is observed to be different in tone, both in the light gray text and the circular university crest, That is to say, page 4 of the document has been completely altered.
YG2NF2	It has been concluded that the questioned printed matter as well as the questioned signature on Exhibit Q1 i.e. a four page (1 - 4) Academic Transcript, was altered.
YGF8ZY	page 4 of the document is altered because paper and signature have an issue.
YKXA84	The academic transcript was altered by the replacement of page 4.
YTREZ6	Through microscopic magnification, it was determined that the signatures on the first three pages were made with a pen, whereas the signature on the fourth page was produced using a color printer. By using the “Projectina Spectra Pro+" device, a comparative analysis of the documents was conducted. An examination revealed that the fourth page was produced by using a different printer, than the one used for the first three pages, indicating a discrepancy in the origin of the documents. Furthermore, under “IK” rays, it was observed that the security background pattern on the fourth page remained visible, whereas on the first three pages the same background pattern became invisible under identical conditions.
Z2FPM7	1. The doubtful document identified as “Academic Transcript”, presents a substitutive alteration of the sheet numbered as “Pg. 4”, since it exhibits a different printing system and the ink does not present the same behavior in a determined range of the spectrum, with respect to the ink with which the sheets numbered as “Pg. 1, Pg. 2 and Pg. 3” were printed. 2. The illegible signature on the support line on the sheet numbered “Pg. 4” corresponds to a reproduction and not a handwritten signature.
Z7U6FH	Findings Methods A visual examination of the submitted item was completed. Instrumental analysis using the Video Spectral Comparator (VSC) and Electrostatic Detection Apparatus (ESDA) were also done. Instrumental Analysis The printing processes, paper, and inks used on pages 1-3 of the questioned transcript in Item #1 could not be differentiated. However, this does not preclude that they may have come from a different source (Inconclusive). The printing processes, paper, and inks used on pages 1-3 of the questioned transcript in Item #1 could be differentiated from page 4 (Source Exclusion). Pages 1-4 of Item #1 were processed for indented writing, however, none was developed. Instrumental examination of the pages did not reveal the presence of indented writing either. Based on all the findings listed above, the transcript in Item #1 was altered. Remarks It should be noted that it cannot be

TABLE 3

WebCode	Conclusions
	determined when the original document was altered. VSC images and images from the indented writing test sheets are being retained with the case documentation in LIMS. All items are available for return. If additional items are to be submitted, please re-submit the original items in their original [Laboratory] labeled packaging.
Z8682G	Page 4 differs significantly from pages 1-3 in its paper characteristics, print appearance, and the method of signature application (being electronic rather than handwritten). No mechanical or chemical alterations to the entries are visible on any of the pages. However, due to the lack of authentic comparison material and/or information regarding the specifications for genuine academic transcripts, it is impossible to definitively determine whether page 4 or pages 1-3 represent the authentic document(s).
ZABRTN	Document "Q1" is altered.
ZLMX6P	The questioned document has been altered.
ZTNCPR	The academic transcript in question has been altered in that the original page 4 of the document has been replaced.
ZVEDTU	The questioned document has probably been altered.

Additional Comments

TABLE 4

WebCode	Additional Comments
2Z3H2N	There is no possibility to add illustrations or pictures to support the conclusion.
36A93A	The examinations conducted are exhaustive of what is available in this lab. Only visual and spectral examinations have been conducted on the printing inks/toners and writing inks used. Additional tests not available at this lab may determine further evidence in relation to this. Unsourced marks observed on the rear of pgs 1 & 2 observed under UV and with ESDA, do not appear on pg 3 or pg 4. These have not been evaluated in my conclusion as they may be accidental features. Further examination can be conducted if genuine specimen of Official Transcript is provided for comparison.
3LEU6V	Spectroscopic and chromatographic techniques (such as TLC, FTIR, and Raman spectroscopy) can be used to examine the inkjet inks and assess whether they are consistent across all pages.
3WHTD6	ADDITIONAL EXAMINATIONS No indented writing of value was observed on the Item 1 (Item Q1) document using side lighting and electrostatic detection. The signatures on Item 1 (Item Q1) are not suitable for handwriting comparisons due to their limited nature. It should be noted that the signature on Item 1 (Item Q1) page 4 is non-original, while the signatures on Item 1 (Item Q1) pages 1 through 3 are original. Additional observations and assessments have been made regarding the submitted Item Q1 and recorded for possible future comparisons.
6KG4A2	The official's signature that appears on the last page of the document in question was printed digitally, whereas it was manually printed on the previous three pages.
6LQDZD	1. Based on the fact that all of the pages of the document are in question, it is undeterminable which part of the transcript is authentic. However, all pages are not consistent with each other which reveals that an alteration did occur. 2. There was no examination of signatures. Statement about signatures in visual examination is an observation only.
6RC4NT	The variations in the measurements captured by the micrometer are insignificant to use in the findings for this report.
7RAVVZ	The document under inspection (academic record consisting of four pages) shows alteration in the form of replacement, because page 4 was replaced in its entirety.
96AG9A	In the optical-physical examination of the document, other aspects were taken into account, such as the determination of the direction of the print head, the satellites generated by the print head, the marks of the drive rollers or spur marks, or the size of the print head. These aspects did not yield a conclusive result or in whose evaluation we were unable to obtain a measurable result, which is why they have not been included in the list of characteristics in section 2. Bibliography: [Text removed for confidentiality purposes]
9JEDWH	In order to consider the matter further I require contemporaneous transcripts from the university, or information as to how a transcript is normally produced i.e., whether it is printed in a single process and whether it should bear original ink signatures on each page.
9LGFJX	- The signature on page 4 of the questioned document (Q1) was produced by a printer/copier, whereas the signatures on pages 1, 2 and 3 of the questioned document (Q1) were written manually using a pen. - The printer/copier used to produce page 4 of the questioned document (Q1) is different from the printer/copier used to produce pages 1, 2 and 3 of the questioned document (Q1). - The reaction of the paper of page 4 of the questioned document (Q1) under UV and IRL lights is different from that of the paper on pages 1, 2 and 3 of the questioned document (Q1). - The reaction of the background print of page 4 of the questioned document (Q1) under IR light is different from that of the background print of pages 1, 2 and 3 of the questioned document (Q1). All these findings prove that the questioned document (Q1) has been altered by the substitution of the fourth page.
9MPMMQ	Proper evaluation of the observations requires more information to be provided in the scenario. What in particular did the employer believe to be "fraudulently modified"? What is "original transcript" defined as?
9R8QUW	Based on result of the expertise I find that the documents on page 1, 2 and 3 in evidence QD, are the same, while the document on page 4 is different.

TABLE 4

WebCode	Additional Comments
BJ6H22	In expressing our results we would not use such definitive language such as "HAS BEEN ALTERED". Especially without access to a specimen of a genuine Academic Record. There is no way of knowing how the Institution produces its academic records and (no matter how reasonable) it is in fact only an assumption that the four pages are made contemporaneously with each other. Furthermore, this appears to be more of a case of page substitution whereas the word 'altered' implies that a genuine document has been changed in order to provide different information to what it originally displayed.
BQYMU3	Our current operating procedures limit the examinations we can conduct and conclusions we are able to render in regards to the alteration of a questioned document.
BVVCDU	The current TEST was carried out by the expert at the [Laboratory].
BVW49G	In relation to page 4, it presents characteristics different from pages 1, 2, and 3, it is concluded that this page was added to the academic file.
CA92QM	Pages 1-3 were printed using an office machine system utilizing inkjet technology; however it was a different office machine then the office machine used to produce page 4. The signature on page 4 was not original writing. It was printed in inkjet. The three signatures on pages 1-3 were written in black ink. The handwriting on the 1st three pages when compared to the signatures on page 4 was determined not to be of common authorship. The paper substrate on pages 1-3 was determined to be different than the paper on page 4.
CMKARU	The current TEST was carried out by the expert at the [Laboratory].
E2ED9P	There was a limitation in the examination due to the known normal specimen of the original transcript template and format used were not available. Therefore, it could not be determined whether pages 1, 2 and 3 were genuine and page 4 was counterfeit, or if page 4 was genuine and pages 1, 2 and 3 were counterfeit.
F3L99M	The applicant should be asked to have the university send an official transcript directly to the employer. If received, this can then be compared with the prior submission.
FUNHMC	There were no indentations on the document.
G4Q3MJ	A major limitation in this instance is the lack of any specimen material showing how this type of transcript is normally produced. The overall scenario, in that regard, is rather suspect because most legitimate transcripts are sent directly from the registrar's office to the recipient, and do not involve any third party such as the individual named in the transcript. Nonetheless, no information or specimen material was provided in this regard. While the observed features were highly suspect and indicate that some form of alteration has likely occurred, it is impossible to say that the document itself was definitely altered in a fraudulent manner, or that it is inauthentic in some way, unless and until this information is provided.
HRATEJ	The use of the term altered is problematic as it confers a sense that the information was changed. In this case, it is not possible to determine if the content has been altered, notwithstanding the difference in print technology. Foremost, the instruction would have been clarified with the client to ensure the conclusion was responding to the appropriate question being asked.
HYR93M	The current TEST was carried out by the expert at the [Laboratory].
JA7H77	The findings indicate that whereas pages 1,2,3 were all made and printed using the same method (most probably inkjet printing) and the signature handprinted on the document using a black ink writing implement, page 4 of the same transcript was made using a different printing technique (most probably laser printing) and the signature too was printed and not handwritten on this page.
JHZTEG	If this was a real case then the investigators would be asked to obtain a reference/genuine transcript and/or a copy of the actual transcript for Susan Smith for comparison purposes.
JL3QMN	No indented writing was observed on Item 1 (Item Q1) pages 1 through 4 using side light or electrostatic processing. However, lifts of the latent images that were observed on Item 1 (Item Q1) using electrostatic processing were generated and are considered secondary evidence and have been designated as Item 2. Due to the limited complexity of the Item 1 (Item Q1) pages 1 through 4 questioned signatures, it is doubtful that these signatures will ever identified to and/or eliminated from a

TABLE 4

WebCode	Additional Comments
	particular writer(s) through handwriting comparisons. Additional assessment and observations have been made regarding the submitted item and are recorded for possible future comparison.
K6UYHX	The submission of a known genuine normal course-of-business Transcript may provide the basis for additional conclusions. If a printer is located, the entire machine, including power cords and/or known samples, should be submitted for examination and comparison. If a handwriting comparison is needed, please submit twenty to twenty-five exact-text exemplars and/or comparable normal course-of-business known initials and signatures of the subject(s) and/or victim(s).
KLEPGX	The significance of this difference is unclear. It could also be explained by the pages of the original accidentally becoming mixed with a copy of that original rather than evidence of fraudulent modification as alleged. It is noted that the total GPA Hrs (121) and GPA (2.70) detailed on the first page of the transcript are correct when using the values seen on all the pages, including page 4. We also note several errors in the transcript, such as the total Points on page 1 (27.7 instead of 327.7), Points of 1.70 (instead of 5.10) awarded for FRSC 252 on page 2 and there being two Fall 2023 semesters (on page 2 and page 3). Enquiries with the issuing University may assist in determining the accuracy of the content of the questioned transcript.
L8VLBT	No evidence of significant indented writing impressions were noted on the Exhibit Q1 item.
LFB2H6	the first pages 1-3 are produced using the multiplication-copy technique, i.e: Blanket - color inkjet type text - inkjet black and white regime signature - holograph, with writing instrument page no. 4 - executed in its entirety using the color inkjet printer copier-multiplication technique, including blank, printed text and signature.
LR3PD4	It is the opinion of the examiner that page 4 of the academic transcript is not authentic and was substituted or altered independently of pages 1 to 3.
M3VTU3	During the execution of my official duties, I kept the exhibit material exclusively under my safekeeping for purposes of examination thereof, by placing it behind lock and key from 2025-04-01 to 2025-04-11. After examination the exhibit material mentioned in paragraph 3 was sealed in an evidence bag with number PAD002939483 and an envelope with number SEJ 100002132.
M7GCY8	In left grazing light on the back of sheets 1, 2 and 3, the edges of the signature on the front can be seen; on sheet 4, no edges can be seen in the signature area.
M8NUVG	The current TEST was carried out by the expert at the [Laboratory].
MNWLZ8	To confirm that the fourth page is the original one, with the first three pages having been replaced, or vice versa, We need to acquire samples of genuine transcript data issued within the same timeframe.
NT726P	Our current operating procedures limit the examinations we can conduct and conclusions we are able to render in regard to the alteration of a questioned document.
PCU62G	The document subject to inspection has an alteration on page four of the academic record provided by Mrs. Susan Smith, in the substitute modality, however, it was not possible to establish the original text.
QALCL9	The size of the characters forming the words “Authorized By:” before the verification signature at the bottom of page 4 is smaller than the other elements of the text, and the distance between the letters forming the text is different from the other document elements on the page. In the same place, the initial letter “By” in the column designation is written in capital letters, while in the text sections “Verified by:” on the first three pages is written in lowercase letter (this can be considered a spelling error). These circumstances can also be considered signs of manipulation.
QCANNY	If this case would have been an actual case at [Laboratory], the questioned document would undergo an additional analytical examination by the analytical team. The analysts would conduct a tactical assessment of the content in the questioned document e.g. a cross-check of the actual information in the document with background and contextual information, as well as an investigation into the issuing authority, signatory etc. In case of academic documents, the analysis team would also investigate if the university exists as an institution and if it is accredited to offer the academic course in question. The analysis team would in many cases, reach out to the university to get a one-to-one verification of the questioned document to make sure that the document was, in fact, issued to the person in question and

TABLE 4

WebCode	Additional Comments
	to confirm the information in the university's own database.
QM8MBY	I would refer to my Report which would have detailed explanation as to why I thought page 4 had been produced at a later date to the previous 3 pages and had been substituted. The Report would include an illustration showing how I had reached my conclusions/ opinion. Would request the whole transcript from Center Square University for comparison.
QMVP4A	The conclusion given herein is based upon the assumption that the process of issuance for the university transcript would have seen it printed all four pages at once and signed upon printing, discounting the possibility of normal use of a secondary printer that might have been used to print the fourth page in the normal course of business. The inkjet-printed signature on Page 4 counterbalances this assumption however, leading to a strong opinion.
QRPR6N	Remarks Images of Pages 1-4 in Item Q1 and EDD lifts Q1A1-Q1A8 in Item Q1A will be retained by the FDU. The EDD lifts in Item Q1A will be returned to the agency.
R7EDNK	Our current operating procedures limit the examinations we can conduct and conclusions we are able to render in regard to the alteration of a questioned document.
RBTRTE	Page 4 of the transcript was a fake.
RU89ZD	The current TEST was performed by the expert at the [Laboratory].
RZBA28	The printed entries on pages 1 to 4 showed similar font type and font size.
T3ZZLC	The current TEST was carried out by the expert at the [Laboratory].
TEDXT2	I would request an original transcript from the university for comparison as well as clarifying information to determine what level of quality control there is for their production of academic transcripts. Specifically, what types of printers are used, what the procedures are for signing to verify the transcripts, and whether the grades are pre-populated by the system, or if they can be modified during the process.
TFJNTP	If a printer is located, the entire machine, including power cords and/or known samples, should be submitted for examination and comparison. Exhibits Q1(1)(a and b) through Q1(4)(a and b) and the ESDA indentations lifts were digitally preserved. Exhibit Q1 will be returned.
U8PXPU	Contact the university to verify the authenticity of the document.
UFH8VJ	Our current operating procedures limit the examinations we can conduct and conclusions we are able to render in regard to the alteration of a questioned document.
UW3YVH	Our current operating procedures limit the examinations we can conduct and conclusions we are able to render in regards to the alteration of a questioned document.
UW4N78	According to the analysis results, it is observed that pages 1, 2, and 3 of Q1 (the four-page academic transcript provided by Susan Smith to the employer) have the same coloring, printing system, and signatures made by ballpoint ink, compared to page 4, which has a different coloring, a different printing system, and a digitally printed signature.
VJX3CF	It would be beneficial to have an uncontested academic transcript available for comparison, without this I do not know the usual method of production. However, I would expect all pages of the academic transcript to have been printed at the same time on the same device. Both pages 2 and 3 have 'Fall 2023' terms. The entry on page 2 is out of chronological sequence, per the summary below. Page 1: Fall 2020, Spring 2021. Page 2: Fall 2021, Spring 2022, Summer 2022, Fall 2023. Page 3: Spring 2023, Summer 2023, Fall 2023, Spring 2024. Page 4: Summer 2024, Fall 2024. The significance of this is unknown. In an actual case I would contact the university for information/advice.
VME6JL	The evidence was examined and imaged. In the event that a handwriting examination is requested in the future, resubmission of the original questioned documents is desired. Please contact the Questioned Document Unit regarding obtaining known writing samples, if necessary.
VQXGY3	REMARKS A genuine transcript from Center Square University was not provided for comparison purposes. Therefore, it cannot be determined whether page 4 specifically, was altered, or fictitious. All

TABLE 4

WebCode	Additional Comments
	examinations were conducted according to established laboratory policies and procedures that are widely accepted in the field of forensic document examination.
VZLBBY	After examining the four-page academic transcripts, concerning SUSAN Smith, it is concluded that page number 1, 2 and 3 were printed simultaneously and derived from the same source, whereas page number 4 was printed separately and does not share the same origin as page number 1, 2 and 3.
WBHJRG	No known specimens from Center Square University were submitted. The printing processes used on, and the characteristics of, genuine transcripts printed by Center Square University are unknown to me. The lack of specimens placed limitations on this examination and the conclusions that could be reached. Submission of specimen transcripts from and/or information of the printing practices of the issuing entity may result in a more definitive conclusion.
XC8ADL	The document "Center Square University Centerlande, Ohio – OFFICIAL TRANSCRIPT", with issue date "12/18/2024", in the name of "Susan Smith", consisting of four pages called "pg.1", "pg.2", "pg.3" and "pg.4", present differences in terms of the quality of the support (paper), the quality of the printing and the signatures present, since: The quality of the Ink-Jet prints held by pg.1, PG.2, and PG.3 is given by physical characteristics of color and tone, where greater definition is observed, tiny dots of blue, yellow and red colors that constitute the printed designs, while PG.4 presents lower definition and tiny dots in yellow and orange colors. Pages pg.1, pg.2 and pg.3 feature handwritten signatures, and pg.4 features an image of a signature obtained in print. The support or paper of pages pg.1, pg.2, and pg.3, presents spectral reaction to ultraviolet light, being opaque, while the support or paper of pg.4 presents slightly fluorescence to ultraviolet light.
XKHQM8	The current TEST was carried out by the expert at the [Laboratory].
XLXVJJ	In a real scenario, we would confirm with the university whether they actually produce their diplomas using an inkjet printer, as this is rather unusual for such a document. We would also request the university to provide a corresponding diploma for comparative studies.
Y4NKU4	On page two of the transcript the sequence of course units goes from “Summer 2022” to “Fall 2023” and there is no entry for “Fall 2022”. On page three of the transcript there is another entry for “Fall 2023”. This appears to be an anomaly but I do not have the information to determine its significance.
YBAFV8	That is to say, page 4 of the document has been completely altered.
YTREZ6	In conclusion, the analysis indicates that the fourth page of the document titled “Center Square University Official Transcript” has been changed.
ZABRTN	The inequalities observed between pages 1 to 3 vs. page 4 is what leads us to the conclusion that document "Q1" has been altered.
ZLMX6P	In the Questioned Document and handwriting unit, distinguishing between two types of inkjet print is not an accredited method in our lab. However, the inkjet on page four differs significantly from the inkjet on page one to three.

-End of Report-
(Appendix may follow)

Collaborative Testing Services ~ Forensic Testing Program

Test No. 25-5211: Questioned Documents Examination

DATA MUST BE SUBMITTED BY **May 12, 2025, 11:59 p.m. EDT** TO BE INCLUDED IN THE REPORT

Participant Code: U1234A WebCode: 9UBEDR

The Accreditation Release section can be accessed by using the "Continue to Final Submission" button above. This information can be entered at any time prior to submitting to CTS.

Scenario:
Susan Smith submitted a four-page questioned academic transcript to her current employer at the time of her employment, as verification of a four-year degree. The employer has reason to believe the transcript may have been fraudulently modified. Ms. Smith maintains that the document is the original transcript she received from her university. Investigators are submitting this four-page academic transcript for your examination to determine if any alterations are indicated that may support the employer's claims.

Items Submitted (Sample Pack QD):
Item Q1: Four-page academic transcript provided by Susan Smith to the employer

1.) Based on the findings of your examination, to what degree can it be confirmed or refuted that the questioned document has been altered?

(Select from the following list. If the wording below differs from the normal wording of your conclusions adapt these conclusions as best you can and use your preferred wording for question 3.)

A. The questioned document HAS BEEN ALTERED.
B. The questioned document HAS PROBABLY BEEN ALTERED.
C. CANNOT DETERMINE whether or not the questioned document has been altered.
D. The questioned document HAS PROBABLY NOT BEEN ALTERED.
E. The questioned document HAS NOT BEEN ALTERED.

Q1

2.) Methods and techniques utilized.

Please note: The list of methods/techniques provided in the dropdown list is not an all inclusive list and should not be used to determine what methods/techniques should be performed. Methods/techniques not on this list may be utilized.

Please briefly indicate the observations made from each method/technique utilized.

Note: *Please use appropriate punctuation to indicate the end of sentences, sections, and statements in the free-form space below. Extra spacing and returns used for separation within your text will not transfer and may cause your information to be illegible in the Summary Report. The use of lists and tabular formats to deliver information is also cautioned against, as these do not transfer.*

3.) What would be the wording of the Conclusions in your report?

Note: *Please use appropriate punctuation to indicate the end of sentences, sections, and statements in the free-form space below. Extra spacing and returns used for separation within your text will not transfer and may cause your information to be illegible in the Summary Report. The use of lists and tabular formats to deliver information is also cautioned against, as these do not transfer.*

4.) Additional Comments

Note: *Please use appropriate punctuation to indicate the end of sentences, sections, and statements in the free-form space below. Extra spacing and returns used for separation within your text will not transfer and may cause your information to be illegible in the Summary Report. The use of lists and tabular formats to deliver information is also cautioned against, as these do not transfer.*

RELEASE OF DATA TO ACCREDITATION BODIES

The Accreditation Release is accessed by pressing the "Continue to Final Submission" button online and can be completed at any time prior to submission to CTS.

CTS submits external proficiency test data directly to ANAB and/or A2LA. Please select one of the following statements to ensure your data is handled appropriately.

- ○ This participant's data is intended for submission to ANAB and/or A2LA. (Accreditation Release section below must be completed.)
- ○ This participant's data is **not** intended for submission to ANAB and/or A2LA.

Have the laboratory's designated individual complete the following steps
only if your laboratory is accredited in this testing/calibration discipline
by one or more of the following Accreditation Bodies.

Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory

ANAB Certificate No.

A2LA Certificate No.

Step 2: Complete the Laboratory Identifying Information in its entirety

Authorized Contact Person and Title

Laboratory Name

Location (City/State)