



Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.

Complete, fold and seal
(see note 2 below)

SURNAME: Hill

FORENAME(S): Wesley

1	Student Number	
2	Title of Examination Paper	Engineering Maths #TCA2
3	Module Code	PCEE4000
4	Date and Time of Examination	May 17 2023 Time: 16:00
5	Examination Venue	Pembrokeshire College
6	Seat Number	
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
1	6
2	6
3	0
4	4 1/2
5	7
6	10
8	6
Total	39.5 ✓

Second Marker

MAE

18/05/23

$$\frac{1}{ax+b} = \frac{1}{a} \ln(ax+b)$$

$$1a) y = 5e^{2x} \cos x$$

$$\frac{dy}{dx} = 5e^{2x} \quad \checkmark$$

$$= 10e^{2x} \quad \checkmark$$

$$\frac{dy}{dx} = 5e^{2x} \times (-10 \sin x) + 10 \cos x \times 10e^{2x}$$

$$\frac{dy}{dx} = -10 \cos x \quad \checkmark$$

$$\frac{dy}{dx} = -5e^{2x} \sin x + 10e^{2x} \cos x \quad \checkmark$$

$$=$$

4 ✓

$$1b) y = \frac{2-3x}{x+1}$$

$$u = 2 \quad v = 3x$$

$$= 2$$

$$= 3x$$

$$\frac{dy}{dx} = \frac{3x \times 2 - 2 \times 3x}{(x+1)^2}$$

$$\frac{dy}{dx} = \frac{6x - 6x}{(x+1)^2}$$

$$1c) y = 5 \sin(3x)$$

$$u = 3x$$

$$= 3x$$

$$x$$

$$5 \sin = 5 \cos u$$

$$\frac{dy}{dx} = 3x \times 5 \cos = 15 \cos \quad 15x \cos(3x) \quad x$$

$$1d) y = \frac{2}{1-x^3} + \sqrt{x} - x$$

$$\frac{dy}{dx} = \frac{2x^{-3}}{1} + \frac{1}{2\sqrt{x}} - x$$

$$\frac{dy}{dx} = -\frac{6}{x^4} + \frac{1}{2\sqrt{x}} - x$$

2 ✓

$$2) v = 12(1 - 7e^{-3t})$$

$$v = 12 - 84e^{-3t}$$

$$v = -252e^{-3t}$$

$$= 252 \text{ V/s}$$

3a)

6 ✓

SDP

$$4a) \int_1^4 (1+3x+5x^2) dx$$

$$= \left[\frac{1x^{0+1}}{0+1} + \frac{3x^{1+1}}{1+1} + \frac{5x^{2+2}}{2+2} \right] dx$$

$$= \left[1x + \frac{3x^2}{2} + \frac{5x^3}{3} \right]_1^4$$

$$x=4 = \frac{1 \times 4 + 3 \times 4^2}{2} + \frac{5 \times 4^3}{3} = 134.6$$

rounding

$$x=1 = \frac{1 \times 1 + 3 \times 1^2}{2} + \frac{5 \times 1^3}{3} = 7.16$$

$$134.6 - 7.16$$

127.44

$$4b) \int_0^{\pi/2} (5 \cos \frac{x}{3} - 2 \sin x) dx$$

$$= \frac{5}{3} \sin \frac{x}{3} - \frac{2}{1} \cos x$$

$$134.6 - 7.16$$

(4)2

$$x = \pi = \frac{5}{3} \sin \frac{\pi/2}{3} - \frac{2}{1} \cos \frac{\pi}{2} = 0.1909$$

$$4b) \int_0^{\pi/2} dx$$

$$x = \pi = \frac{5}{3} \sin \frac{\pi/2}{3} - \frac{2}{1} \cos \frac{\pi}{2} = 0.1909$$

x

$$x=0 = \frac{5}{3} \sin \frac{0}{3} - \frac{2}{1} \cos \frac{0}{2} = 0$$

$$0.1909 - 0 = 0.1909$$

x

$$5) \int_3^5 \frac{19x-5}{2x(x-1)} = \frac{A}{2x} + \frac{B}{x-1} = \frac{A(x-1)+B(2x)}{2x(x-1)}$$

$$x=1 = A(1-1) + 2B \quad x=1 = 19 \times 1 - 5 = A(1-1) + 2B \times 1$$

$$= 14 = 2B$$

$$B = 7$$

(7)

7DP

$$x=0 = A(0-1) + 2b \times 0$$

$$x=0 = 19 \times 0 - 5 = A(0-1) + 2b \times 0$$

$$-5 =$$

$$A = \frac{5}{14}$$

$$\int_3^5 \frac{-1}{2x} dx + \frac{7}{x-1} dx$$

$$= \frac{-1}{14} \int_3^5 \frac{1}{2x} dx + 7 \int_3^5 \frac{1}{x-1} dx$$

$$= \frac{-1}{14} \times \frac{1}{2x} \ln(2x) + 7 \times \frac{1}{x-1} \ln(x-1)$$

$$x=5 = \frac{-1}{14} \times \frac{1}{2 \times 5} \ln(2 \times 5) + 7 \times \frac{1}{5-1} \ln(5-1) = 2.4096$$

$$x=3 = \frac{-1}{14} \times \frac{1}{2 \times 3} \ln(2 \times 3) + 7 \times \frac{1}{3-1} \ln(3-1) = 2.4047$$

$$2.4096 - 2.4047 = 0.0049$$

x

6)

x	3	3.5	4	4.5	5
$\frac{19x-5}{2x(x-1)}$	$\frac{13}{5}$	$\frac{123}{35}$	$\frac{71}{24}$	$\frac{23}{9}$	$\frac{9}{4}$
	y_0	y_1	y_2	y_3	y_n
					✓

$$\frac{1}{3} \times 0.5 \left(\frac{13}{5} + \frac{9}{4} + 4 \left(\frac{123}{35} + \frac{23}{9} \right) + 2 \left(\frac{71}{24} \right) \right)$$

$$= 6.1299$$

101

JDP

$$\text{Percentage error} = \frac{0.0044 - 6.1291}{6.1291}$$

7) Midpoint $\bar{x}$	1.25	0.75	2.75	4.75	6.75	8.75	Σ
Frequency	1	16	26	5	2	50	
$f \times x$	0.75	44	123.5	33.75	17.5	219.5	
	9.93	118.34	16.0056	17.97	332.66	664.956	

$$\frac{\Sigma fx}{\Sigma f} = \frac{219.5}{50} = 4.39 \quad \times$$

$$S = \frac{\sqrt{\Sigma f(x-\bar{x})^2}}{\Sigma f - 1} = \frac{\sqrt{664.9056}}{50-1} = 3.6836 \quad \times$$

8) Switch a = 0.97 Switch b = 0.89

$$a) 0.97 \times 0.89 = 0.86 \quad \checkmark$$

$$b) 1 - 0.97 = 0.03$$

$$1 - 0.89 = 0.11$$

$$0.03 \times 0.11 = 0.0033 \quad \checkmark$$

$$1 - 0.033 = 0.96 \quad \times$$

(6) $\checkmark$

