

PRIFYSGOL CYMRU

Y Drindod Dewi Sant

UNIVERSITY OF WALES

Trinity Saint David

Examination Answer Book

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 and seal 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).
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1	Student Number	
2	Title of Examination Paper	TC 2
3	Module Code	PCEE4000
4	Date and Time of Examination	22.5.19 9:15
5	Examination Venue	Pembrokeshire College
6	Seat Number	

7	Number of Answer Books handed in	1
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[illegible]

Second Mark *DDH*

- FOLIO

Complete
section,
remove
strip, fold as
indicated
and SEAL

Please complete this section and SEAL before the examination starts.

Surname Watts (Block Capitals) Forename(s) Robert James

Surname Watts

PULL & TEAR

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$$i) y = 5x^2 + \frac{5}{x^2} - 8$$

$$= 5x^2 + 5x^{-2} - 8$$

$$\frac{dy}{dx} = 10x - 2 \times 5x^{-3}$$

$$= 10x - 10x^{-3}$$

$$= 10x - \frac{10}{x^3}$$

(4)

$$ii) y = x^3 \cos 5x$$

$$u = x^3$$

$$v = \cos 5x$$

$$\frac{du}{dx} = 3x^2$$

$$\frac{dv}{dx} = -5 \sin(5x)$$

$$\frac{dy}{dx} = x^3(-5 \sin(5x)) + \cos 5x(3x^2)$$

$$= -5x^3 \sin(5x) + 3x^2 \cos(5x)$$

$$= x^2(-5x \sin(5x) + 3 \cos(5x))$$

(6)

$$iii) y = 4 \sin(2x-3)$$

$$= 4 \sin(u)$$

$$u = 2x-3$$

$$\frac{du}{dx} = 2$$

$$\frac{dy}{du} = 4 \cos(u)$$

$$\frac{dy}{dx} = 4 \cos(u) \times 2$$

$$= 8 \cos(2x-3)$$

(6)

✓
SDP

$$1 \text{ iv) } y = \frac{2 \sin 3x}{x^3}$$

$$u = 2 \sin(3x) \quad v = x^3$$

$$\frac{du}{dx} = 6 \cos(3x) \quad \frac{dv}{dx} = 3x^2$$

$$\frac{dy}{dx} = \frac{x^3 (6 \cos(3x)) - 2 \sin(3x) \times 3x^2}{(x^3)^2}$$

$$= \frac{6x^3 \cos(3x) - 6x^2 \sin(3x)}{x^6}$$

$$= \frac{6x^2 (x \cos(3x) - \sin(3x))}{x^6}$$

(5)

$$2) i = 2(7 - 3e^{-0.5t})$$

$$= 14 - 6e^{-0.5t}$$

$$\frac{di}{dt} = -0.5 \times -6e^{-0.5t}$$

$$= 3e^{-0.5t}$$

$$\text{initial} = 0$$

$$= 3e^{-0.5 \times 0}$$

$$= 3 \text{ V/s}$$

(8)

$$3i) \int_1^3 (5 - 4x + 4x^3) dx$$

$$= \left[\frac{5x^{0+1}}{1} - \frac{4x^2}{2} + \frac{4x^4}{4} \right]_1^3$$

$$= \left[5x - 2x^2 + x^4 \right]_1^3$$

$$x=3 = \left[5 \times 3 - 2 \times 3^2 + 3^4 \right] = 78$$

$$x=1 = \left[5 \times 1 - 2 \times 1^2 + 1^4 \right] = 4$$

$$\text{Area} = 78 - 4 = 74 \text{ units}^2$$

$$3ii) \int_{-\pi}^{\pi} (3 \sin(x) + 6 \cos(\frac{1}{2}x)) dx$$

$$= \left[-\frac{3}{1} \cos(x) + \frac{6}{\frac{1}{2}} \sin(\frac{1}{2}x) \right]_{-\pi}^{\pi}$$

$$= \left[-3 \cos(x) + 12 \sin(\frac{1}{2}x) \right]_{-\pi}^{\pi}$$

$$x=\pi = \left[-3 \cos(\pi) + 12 \sin(\frac{1}{2}\pi) \right] = 15$$

$$x=-\pi = \left[-3 \cos(-\pi) + 12 \sin(\frac{1}{2}(-\pi)) \right] = -9$$

$$\text{Area} = 15 - (-9) = 24 \text{ units}^2$$

8

8

5/11

$$4 \quad \frac{5x-6}{4x(x-2)} = \frac{A}{4x} + \frac{B}{(x-2)} = \frac{A(x-2) + B(4x)}{4x(x-2)} \quad \checkmark$$

$$5x-6 = A(x-2) + B(4x) \quad \checkmark$$

$$x=0 = 5 \times 0 - 6 = A(0-2)$$

$$-6 = -2A$$

$$\frac{-6}{-2} = A$$

$$3 = A \quad \checkmark$$

$$x=2 = 5 \times 2 - 6 = B(4 \times 2)$$

$$4 = 8B$$

$$\frac{4}{8} = B$$

$$\frac{1}{2} = B \quad \checkmark$$

$$\int_3^4 \frac{3}{4x} + \frac{1}{2(x-2)} = \int_3^4 \frac{3}{4x} + \frac{1}{2x-4} dx \quad \checkmark$$

$$= \left[\frac{3}{4} \ln(4x) + \frac{1}{2} \ln(2x-4) \right]$$

$$x=4 = \left[\frac{3}{4} \ln(4 \times 4) + \frac{1}{2} \ln(2 \times 4 - 4) \right] = 2.7726$$

$$x=3 = \left[\frac{3}{4} \ln(4 \times 3) + \frac{1}{2} \ln(2 \times 3 - 4) \right] = 2.2103$$

$$\text{@ } 2.7726 - 2.2103 = 0.5623 \quad \checkmark$$

5. $\frac{4}{3} \left(\frac{5x-6}{4x(6x-2)} \right) \quad h = 4-3 = 1/4 = 0.25$

x	3	3.25	3.5	3.75	4
y	$\frac{3}{4}$ ✓ y_0	$\frac{41}{65}$ ✓ y_1	$\frac{23}{42}$ ✓ y_2	$\frac{17}{35}$ ✓ y_3	$\frac{7}{16}$ ✓ y_4

$$\frac{1}{3} \times 0.25 \left(\left(\frac{3}{4} + \frac{7}{16} \right) + 4 \left(\frac{41}{65} + \frac{17}{35} \right) + 2 \left(\frac{23}{42} \right) \right)$$

$$= 0.5624 \quad \checkmark$$

$$\text{Percentage error} = \frac{0.5623 - 0.5624}{0.5623} \times 100$$

$$= -0.02\% \text{ error} \quad \checkmark$$

14

✓

570

6)	x	f	fx	$f(x - \bar{x})^2$
	5	2	10	800
	15	10	150	1000
	25	17	425	0
	35	8	280	800
	45	3	135	1200
	$\Sigma = 40$		$\Sigma = 1000$	$\Sigma = 3800$

$$\bar{x} = \frac{1000}{40} = 25$$

$$sd = \sqrt{\frac{3800}{40-1}} = 9.871$$

$$7i) P(A) = 0.75 \quad P(B) = 0.82$$

$$P(\text{connection}) = 0.615$$

$$7ii) P(\bar{A}) = 0.25 \quad P(\bar{B}) = 0.18$$

$$0.25 \times 0.18 = 0.045 = P(\text{no connection})$$

$$P(\text{connection}) = 1 - 0.045 = 0.955.$$

8

SDP