



Prifysgol Cymru
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University of Wales
Trinity Saint David

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: Griffiths

FORENAME(S): Tomas

1	Student Number	2015849 153975
2	Title of Examination Paper	TCA2
3	Module Code	PCEE4000/PCEP 4000
4	Date and Time of Examination	2:00
5	Examination Venue	Pembrokeshire College
6	Seat Number	N/A
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
7	8
2	6
3	1
1	19
6	7
5	10
4	8
Office Use	59 ✓

Second Marking
SD/PC
25/05/21

7.

$$A = 0.77 \quad B = 0.81$$

$$\text{Series} = A \times B$$

$$= 0.77 \times 0.81$$

$$\text{Series} = 0.6237 \quad \checkmark$$

$$\text{Parallel} = \bar{A} \times \bar{B}$$

$$\begin{aligned} \bar{A} &= 1 - 0.77 \\ &= 0.23 \end{aligned}$$

$$\begin{aligned} \bar{B} &= 1 - 0.81 \\ &= 0.19 \end{aligned}$$

$$= \bar{A} \times \bar{B}$$

$$= 0.23 \times 0.19$$

$$= 0.0437 \quad \checkmark$$

$$= 1 - 0.0437$$

$$= 0.9563 \quad \checkmark$$

$$\text{Parallel} = 0.9563 \quad \checkmark$$

(8) ✓

2.

$$V = 10(2 - 3e^{-4t})$$

$$t = 0$$

$$V = 20 - 30e^{-4t} \quad \checkmark$$

$$V = -30e^{-4t} \quad \times$$

$$\frac{dV}{dt} = 120e^{-4t}$$

$$V = 120e^{-4 \times 0}$$

$$V = 120e^0 \quad \checkmark$$

$$V = 120 \times 1$$

$$V = 120$$

$$V = 120 \text{ v/s} \quad \checkmark$$

(b) ✓

3.d. $\int_3^4 (20 + 5x^2 - 2x^3) dx$

$$\int_3^4 \left(20x + \frac{5x^3}{5} - \frac{2x^4}{2} \right) dx$$

① ✓

$$\int_3^4 (20x + x^3 - x^4) dx$$

(4) $\int_3^4 (20 \times 4 + 4^3 - 4^4) dx$

$$\int_3^4 (80 + 64 - 256) dx$$

$$= -112$$

(2) $\int_2^4 (20 \times 2 + 2^3 - 2^4) dx$

$$\int_2^4 (40 + 8 - 16) dx$$

$$= 32 \quad \rightarrow \quad -112 - 32 = -144$$

3.6.

$$\int_0^{\pi} \left(3 \sin \frac{x}{2} - \cos \frac{x}{4} \right) dx$$

~~$$\int_0^{\pi} \left(-\frac{3}{2} \cos \frac{x}{2} - \frac{1}{4} \sin \frac{x}{4} \right) dx$$~~

~~$$\int_0^{\pi} \left(-\frac{3}{2} \cos \frac{\pi}{2} - \frac{1}{4} \sin \frac{\pi}{4} \right) dx$$~~

~~$$\int_0^{\pi} \left(4 \cos 4x - 3 \sin 2x \right) dx$$~~

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

$$= 4$$

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

$$= 4$$

$$(\pi) \quad (0)$$

$$4 - 4 = 0$$

1.a.

$$y = \frac{1}{3x^4} - 2x^5 - \sqrt{x}$$

$$y = \frac{1x^{-4}}{3} - 2x^5 - 1x^{-\frac{1}{2}}$$

$$\frac{dy}{dx} = \frac{-4x^{-5}}{3} - 10x^4 + \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{dy}{dx} = \frac{-4}{3x^5} - 10x^4 + \frac{1}{2\sqrt{x}}$$

(3) ✓

1.b.

$$y = \frac{5 \cos 2x}{x^4} \quad u \quad v \quad (\text{quotient})$$

$$u = 5 \cos 2x \quad v = x^4$$

$$\frac{du}{dx} = -10 \sin 2x \quad \frac{dv}{dx} = 4x^3$$

$$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{dy}{dx} = \frac{x^4 \times -10 \sin 2x - 5 \cos 2x \times 4x^3}{(x^4)^2}$$

$$\frac{dy}{dx} = \frac{-10x^4 \sin 2x - 20x^3 \cos 2x}{x^8}$$

(6) ✓

SPP

I.C.

$$y = 2 \cos(u) (4x^2)$$

(function of a function)

$$y = 2 \cos(u) \quad u = 4x^2$$

$$\frac{dy}{du} = -2 \sin(u) \quad \frac{du}{dx} = 8x$$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$\frac{dy}{dx} = -2 \sin(u) \times 8x$$

$$\frac{dy}{dx} = -16 \sin 4x$$

$$\frac{dy}{dx} = -16x \sin 8x$$

I.d.

$$y = 5x^2 e^{4x}$$

(Product)

$$u = 5x^2 \quad v = e^{4x}$$

$$\frac{du}{dx} = 10x \quad \frac{dv}{dx} = 4e^{4x}$$

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{dy}{dx} = 5x^2 \times 4e^{4x} + e^{4x} \times 10x$$

1d. $\frac{dy}{dx} = 20e^{8x} + 10e^{5x}$ x

$$\frac{dy}{dx} = 30e^{13x} \quad x$$

6.

Time (s)	$0 \leq t < 2$	$2 \leq t < 4$	$4 \leq t < 6$	$6 \leq t < 8$	$8 \leq t < 10$
Frequency (f)	3	19	24	10	4
Midpoint (x)	1	3	5	7	9
$f \times x$	~~3~~ 3	57	120	70	36

$$\Sigma f = 60$$

$$\Sigma x = 25$$

$$\Sigma fx = 286$$

$$\bar{x} = \frac{\Sigma fx}{\Sigma f} \quad \bar{x} = \frac{286}{60} \neq \frac{143}{30}$$

(7)

$$\sigma = \sqrt{\frac{\Sigma f(x - \bar{x})^2}{\Sigma f}}$$

$$\sigma = \sqrt{\frac{60(25 - \frac{143}{30})^2}{60}} \quad \times$$

$$\sigma = \sqrt{\frac{368449}{15 \times 60}}$$

$$\sigma = \frac{607}{30}$$

S. $\int_1^3 \frac{2x+1}{4x(x+2)} \quad \text{so} \quad \frac{3-1}{4} = 0.5$

$h = 0.5 / \frac{1}{2}$

y_0	y_1	y_2	y_3	y_n
1	1.5	2	2.5	3 ✓
$\frac{1}{4}$	$\frac{4}{21}$	$\frac{5}{32}$	$\frac{2}{15}$	$\frac{7}{60}$ ✓

Simpson's Rule:

$$= \frac{1}{3} h \left\{ (y_0 + y_n) + 4(y_1 + y_3) + 2(y_2) \right\}$$

$$= \frac{1}{3} \times \frac{1}{2} \left\{ \left(\frac{1}{4} + \frac{7}{60} \right) + 4 \left(\frac{4}{21} + \frac{2}{15} \right) + 2 \left(\frac{5}{32} \right) \right\} ✓$$

$$= \frac{1}{6} \left\{ \left(\frac{11}{30} \right) + 4 \left(\frac{34}{105} \right) + \left(\frac{5}{16} \right) \right\} ✓$$

$$= \frac{1}{6} \left\{ \frac{11}{30} + \frac{136}{105} + \frac{5}{16} \right\}$$

$$= \frac{1}{6} \{ 1.974404762 \}$$

$$= \boxed{0.3291} ✓$$

$$\frac{0.3291 \times 0.3291}{0.3291} \times 100$$

$$= 32.91\% ✓$$

10 ✓

$$4. \quad \frac{2x+1}{4x(x+2)} = \frac{A}{4x} + \frac{B}{x+2} = \frac{A(x+2) + B(4x)}{4x(x+2)}$$

$4x(x+2)$ Cancels

$$2x+1 = A(x+2) + \cancel{B(4x)} \quad \checkmark$$

$$x = -2$$

$$2 \times -2 + 1 = -8B$$

$$-3 = -8B \quad \checkmark$$

$$\frac{-3}{8} = B \quad \times$$

$$B = -0.375$$

$$x = 0 \quad 2 \times 0 + 1 = 2A$$

$$1 = 2A$$

$$\frac{1}{2} = A$$

$$A = 0.5 \quad \checkmark$$

(8) ✓