



SURNAME: HAMMOND

FORENAME(S): JAMES RHYS

12 Pages

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.**

1	Student Number	
2	Title of Examination Paper	TCA 2
3	Module Code	PCEE4000/ PCPO 4000
4	Date and Time of Examination	17/5/2023
5	Examination Venue	PEMBROKESHIRE COLLEGE
6	Seat Number	
7	Number of Answer Books handed in	

[illegible]

Second Marker
SDR
18/05/23

8/ A = 0.97 Series $0.97 \times 0.89 = \underline{0.8633}$ ✓
 B = 0.89

Parallel = $1 - 0.97 = 0.03$ $0.03 \times 0.11 = 0.0033$
 $1 - 0.89 = 0.11$ $= 0.0033$
 $1 - 0.0033 = \underline{0.9967}$ ✓

(8) ✓

7/

Time	$0 \leq 2$	$2 \leq 4$	$4 \leq 6$	$6 \leq 8$	$8 \leq 10$	Σf
f	1	16	26	5	2	50
x	1	3	5	7	9	✓
fx	1	48	130	35	18	$\Sigma fx = 232$ ✓
$f(x-\bar{x})^2$	$1(1-4.64)^2$ $= 13.2496$	$16(3-4.64)^2$ $= 43.0336$	$26(5-4.64)^2$ $= 3.696$	$5(7-4.64)^2$ $= 27.848$	$2(9-4.64)^2$ $= 38.0192$	

$\bar{x} = \frac{\Sigma fx}{\Sigma f}$
 $\bar{x} = \frac{232}{50} = \underline{4.64}$ ✓

$\Sigma f(x-\bar{x})^2 = 125.52$ ✓ $\sigma = \sqrt{\frac{\Sigma f(x-\bar{x})^2}{\Sigma f - 1}}$

$\sigma = \sqrt{\frac{125.52}{50-1}} = 1.6005$
 $\sigma = \underline{1.601}$ ✓

(14) ✓

2/5/

$$\int_3^5 \frac{19x-5}{2x(x-1)}$$

$$\frac{A}{2x} \times \frac{B}{x-1}$$

$$19x - 5 = A(x-1) + 2Bx$$

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

$$14 = 2B$$

$$B = 7$$

$$x = 0 \quad 19 \times 0 - 5 = A \times 0 - 1$$

$$-5 = A - 1$$

$$A = \frac{-5}{-1}$$

$$A = 5$$

no working for integration

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

$$5 \rightarrow \frac{5}{2} (\ln(2 \times 5) + 7 \ln(5-1)) = 15.4605$$

$$3 \rightarrow \frac{5}{2} \ln(2 \times 3) + 7 \ln(3-1) = 9.3314$$

$$15.4605 - 9.3314 = 6.1291 \text{ units}^2$$

$$15.4605 - 9.3314 = 6.1291$$

$$6.1291$$

$$15.4605 - 9.3314 = \underline{6.1291}$$

$$6.1291 \text{ units}^2$$

11

SDP

6/

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

15.6115

$$\frac{1}{3} \times \frac{1}{2} (y_0 + y_n) + 4(y_1 + y_3) + 2(y_2)$$

$$\frac{13}{3} = 4.33333$$

$$\frac{123}{35} = 3.51429$$

$$\frac{71}{24} = 2.95833$$

$$\frac{23}{9} = 2.55556$$

$$\frac{9}{4} = 2.25$$

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

$$= 6.12989 \quad \checkmark$$

$$= \frac{15.6115 - 13.4071}{13.4071} \times 100$$

$$= 18.44\%$$

7/8

$$\frac{6.1291 - 6.12989}{6.1291} \times 100 = 0.0129$$

$$\frac{6.12989 - 6.1291}{6.12989} \times 100 = 0.1289 \quad \checkmark$$

$$= 0.13\% \quad \checkmark$$

(12) ✓

SDP

4/11

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

$$1x^0 + 3x^1 + 5x^2$$

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

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

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

$$4 \Rightarrow 4 + \frac{3 \times 4^2}{2} + \frac{5 \times 4^3}{3} = \underline{134.667}$$

$$1 \rightarrow 1 + \frac{3 \times 1^2}{2} + \frac{5 \times 1^3}{3} = \underline{4.1667}$$

$$134.667 - 4.1667 = 130.5003$$

(8)

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

$$\left[\frac{5}{1/3} \sin \frac{1}{3}x + \frac{2}{1} \cos x \right]_0^{\pi/2}$$

$4 \cos nx \rightarrow \frac{4}{n} \sin nx$
 $5 \cos \frac{x}{3} \rightarrow \frac{5}{1/3} \sin \frac{1}{3}x$

$$\frac{\pi}{2} \rightarrow \frac{5}{1/3} \sin \frac{1}{3} \times \frac{\pi}{2} + \frac{2}{1} \cos \frac{\pi}{2}$$

$a \sin nx \rightarrow -\frac{a}{n} \cos nx$
 $2 \sin nx \rightarrow -\frac{2}{1} \cos x$

$$= \frac{15}{2} \checkmark$$

$$0 \rightarrow \frac{5}{1/3} \sin \frac{1}{3} \times 0 + \frac{2}{1} \cos 0 = 2 \checkmark$$

$$\frac{15}{2} - 2 = \frac{11}{2} \checkmark$$

8 ✓

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

$$12 \times 1 - 12 \times 7$$

$$12 - 84 e^{-3t} \checkmark$$

$$-3 \times -84 = 252 e^{-3t}$$

$$252 e^0$$

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

6 ✓

10) ~~by hand~~

SDP