

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.

1	Student Number	
2	Title of Examination Paper	TCA1
3	Module Code	PCFE4000
4	Date and Time of Examination	11.15 15/11/25
5	Examination Venue	Pembroke College
6	Seat Number	
7	Number of Answer Books handed in	

(Gweler yr ochr arall am y fersiwn Cymraeg)

List the numbers of the questions you have attempted	1	4
	2	16
	3	12
	#4	14
	5	15
	6	14
	7	12
	8	4
	9	8
Total		99

Second Marked
15/11/25
12/02/25

Complete, fold and seal
(see note 2 below)

SURNAME: Alesawil

FORENAME(S): Turki

2.

(1)

$$5(2-x) - 4(5-2x) - 2 = 0$$

$$10 - 5x - 20 + 8x - 2 = 0$$

$$-12 + 3x = 0$$

$$3x = 12$$

$$x = \frac{12}{3} = 4$$

(11)

$$5x^2 + 14x - 3 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-14 \pm \sqrt{14^2 - 4 \times 5 \times (-3)}}{2 \times 5}$$

$$x = \frac{-14 \pm \sqrt{196 + 60}}{10}$$

$$x = \frac{-14 \pm 16}{10}$$

$$x_1 = \frac{-14 - 16}{10} = -3$$

$$x_2 = \frac{-14 + 16}{10} = \frac{1}{5}$$

$$(111) \quad 3.25 \times 10^{3x-2} = 52$$

$$10^{3x-2} = \frac{52}{3.25} = 16$$

$$3x - 2 = \log_{10} 16$$

1.

$$f_o = \frac{1}{2\pi \sqrt{LC}}$$

$$\sqrt{LC} = \frac{1}{2\pi f_o}$$

$$LC = \left(\frac{1}{2\pi f_o} \right)^2 = \frac{1}{4\pi^2 f_o^2}$$

$$L = \frac{4\pi^2 f_o^2 C}{1}$$

4

3

6

501

(!!!)

$$\frac{Z_1}{Z_2} = \frac{4+j}{2-4j} = \frac{4+j}{2-4j} \times \frac{2+4j}{2+4j} = \frac{8+16j+2j+4j^2}{4+18j-4}$$

$$= \frac{4+18j}{4+16j} = \frac{20}{4+18j} = \frac{20}{4} + \frac{20}{18}j = \frac{5}{1} + \frac{10}{9}j$$

(iv) $(Z_1)^5 = (4+j)^5$

$$r = \sqrt{4^2 + 1^2} = \sqrt{17}$$

$$\theta = \tan^{-1} \frac{1}{4} = 14.036^\circ$$

$$(Z_1)^5 = (\sqrt{17} \angle 14.036^\circ)^5$$

$$= (\sqrt{17})^5 \angle 5 \times 14.036^\circ$$

$$= 1191.58 \angle 70.18^\circ$$

Keep 3dp with final answer

$$(Z_1)^5 = 1191.58 \cos 70.18^\circ + 1191.58 \sin 70.18^\circ j$$

$$= 404.02 + 1121.00j$$

Rounding error.

5.

(i)

$$4A - 2B = 4 \times \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix} - 2 \times \begin{bmatrix} 4 & 1 \\ -2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 0 \\ -4 & 12 \end{bmatrix} - \begin{bmatrix} 8 & 2 \\ -4 & 8 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & -2 \\ 0 & 4 \end{bmatrix}$$

(ii) $AB = \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix} \begin{bmatrix} 4 & 1 \\ -2 & 4 \end{bmatrix}$

$$= \begin{bmatrix} 8+0 & 2+0 \\ -4-6 & -1+12 \end{bmatrix} = \begin{bmatrix} 8 & 2 \\ -10 & 11 \end{bmatrix}$$

$$BA = \begin{bmatrix} 4 & 1 \\ -2 & 4 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} 8-1 & -4-4 \\ 0+3 & 0+12 \end{bmatrix}$$

$$= \begin{bmatrix} 7 & 3 \\ -8 & 12 \end{bmatrix} \neq AB$$

5DP

(4)

$$= 4046.25$$

$$= 4046.25$$

$$= \frac{2}{26} (2 \times 65 + (26-1) \times 25)$$

$$S_1 = \frac{2}{n} (2a + (n-1)d)$$

$$8. \quad n = 26 \quad a = 65 \quad d = 25 \quad f = 25$$

(9)

$$y = -2x + 6$$

$$C = 2 + 4 = 6$$

$$2 = -4 + C$$

$$2 = -2 \times 2 + C$$

$$C = -2x + 6$$

$$m = -\frac{1}{2} = -2$$

$$(11) \quad y = mx + c$$

$$y = \frac{1}{2}x - 2$$

$$C = -2$$

$$-2 = \frac{1}{2} \times 0 + C$$

$$y = \frac{1}{2}x + C$$

$$m = \frac{-1 - (-2)}{2 - 0} = \frac{1}{2}$$

(2)