



Examination Answer Books

12 Pages

Instructions to Candidates

- Please give the information requested in the boxes below.
- Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.

- 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.

- Write your answers in ink.
- Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
- No part of this book is to be torn out; it must be handed in complete.

- If more books than one are used, fasten them together using the tags available from the invigilator(s).

- 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	TCA1
3	Module Code	PCFE4000
4	Date and Time of Examination	11:15 15/01/2025
5	Examination Venue	Pembrokeshire College
6	Seat Number	
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	1
	2
	3
	4
	5
	6
	7
	8
	9
Total	81

Second Marked
57/100
12/02/25

1.

$$f_0 = \frac{27\sqrt{12}}{1}$$

$$f_0 \sqrt{12} = \frac{27}{1}$$

$$f_0 \sqrt{12} = \sqrt{\frac{1}{27}}$$

$$L = \sqrt{\frac{1}{27 f_0 C}}$$

$$\times \sqrt{12}$$

$$\times \sqrt{12}$$

$$\div f_0 C$$

square rooted - not squared here!

x

2:

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

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

$$-12 + 3x = 0$$

$$3x = 12$$

$$x = 4$$

2:

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

$$a \quad b \quad c$$

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

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

$$x = \frac{5}{2} \quad (-) \quad x = -3 \quad (+)$$

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

$$x(5x-14) - 3 = 0$$

$$x(5x-14) - 3 = 0$$

6

3

1

dec

$$4! \quad Z_1 = 4 + j \quad Z_2 = 2 - 4j$$

$$(4 + j) - (2 - 4j) = 2 + 5j$$

$$4! \quad Z_1 Z_2 = (4 + j)(2 - 4j)$$

$$= 8 - 16j + 2j - 4j^2$$

$$= 8 - 14j + 4$$

$$= 12 - 14j$$

$$4! \quad Z_1 Z_2 = \frac{4 + j}{2 - 4j} \times \frac{-2 - 4j}{-2 - 4j}$$

$$= \frac{4 + j}{-8 - 16j - 2j - 4j^2}$$

$$= \frac{4 + j}{-8 - 18j + 4}$$

$$= \frac{4 + j}{-4 - 18j}$$

usually
negative
imaginary
part - however
negative real
part does
work.

$$\rightarrow \frac{-4 - 16j}{-4 - 18j} \rightarrow \frac{-4 - 16j}{-4 - 18j} \rightarrow \frac{-4 - 16j}{-4 - 18j}$$

$$-\frac{4}{4} \rightarrow \frac{1}{1} \quad \frac{18}{18} \rightarrow \frac{20}{20} \quad \frac{10}{9}$$

$$\frac{1}{5} + \frac{10}{9}j$$

①

②

⑤

105

5!

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

$4A - 2B$

$$\begin{pmatrix} 4 \times 2 & 4 \times 0 \\ 4 \times -1 & 4 \times 3 \end{pmatrix} - \begin{pmatrix} 2 \times 4 & 2 \times 1 \\ 2 \times -2 & 2 \times 4 \end{pmatrix} \rightarrow \begin{pmatrix} 8 & 0 \\ -4 & 12 \end{pmatrix} - \begin{pmatrix} 8 & 2 \\ -4 & 8 \end{pmatrix}$$

$$\begin{pmatrix} 8 & 0 & -2 \\ -4 & -4 & 12 & -8 \end{pmatrix} \rightarrow \begin{pmatrix} 0 & 0 \\ 0 & 4 \end{pmatrix}$$

5!! AB

$$\begin{pmatrix} 2 & 0 \\ -1 & 3 \end{pmatrix} \times \begin{pmatrix} 4 & 1 \\ -2 & 4 \end{pmatrix}$$

$$\begin{pmatrix} 2 \times 4 & 2 \times 1 \\ 0 \times -2 & 0 \times 4 \\ -1 \times 4 & -1 \times 1 \\ 3 \times -2 & 3 \times 4 \end{pmatrix} \rightarrow \begin{pmatrix} 8+0 & 2+0 \\ -4+-6 & -1+12 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 1 \\ -2 & 4 \end{pmatrix} \times \begin{pmatrix} 2 & 0 \\ -1 & 3 \end{pmatrix}$$

5!!!

$$\begin{pmatrix} 4 \times 2 & 4 \times 0 \\ 1 \times -1 & 1 \times 3 \\ -2 \times 2 & -2 \times 2 \\ 4 \times -1 & 4 \times -1 \end{pmatrix} \rightarrow \begin{pmatrix} 8+1 & -4+-4 \\ 0+3 & -4+-4 \\ -8-8 & -8-8 \end{pmatrix}$$

$$\begin{pmatrix} 8 & 2 \\ -10 & 11 \end{pmatrix} \neq \begin{pmatrix} 8 & -8 \\ 0 & -8 \end{pmatrix} \text{ so } AB \neq BA$$

50p

3

perpendicular to $(2, -1)$

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

$-1 = -2 \times 2 + c$

$-1 = -4 + c$

$c = 3$

$y = -2x + 3$

6

$y = mx + c$

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

$-2 = c$

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

$m = \frac{y_b - y_a}{x_b - x_a} \rightarrow \frac{-2 - (-1)}{0 - 2} \rightarrow \frac{-1}{-2} \rightarrow \frac{1}{2}$

14

7! $(2, -1) (0, -2)$

current through 6Ω resistor = $\frac{6}{13}A$

current through 5Ω resistor = $\frac{2}{13}A$

current through 15Ω resistor = $\frac{6}{13} + \frac{2}{13} = \frac{8}{13}A$

$\frac{30}{195} \rightarrow \frac{2}{13}$

$\frac{21 \times 10 - 15 \times 12}{21 \times 20 - 15 \times 15} \rightarrow \frac{210 - 180}{420 - 225}$