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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.
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1	Student Number	RAM 20849142
2	Title of Examination Paper	Mathematics
3	Module Code	GOEN 4001
4	Date and Time of Examination	19/05/2025 13:30
5	Examination Venue	TYCDEH
6	Seat Number	H6
7	Number of Answer Books handed in	1

Complete, fold and seal
(see note 2 below)

SURNAME: IZAMADHAN

FORENAME(S): NARIMAN

List the numbers of the questions you have attempted	Office Use
Q1	23 ✓
Q2	28 ✓
Q3	13 ✓
Total	64/100 ✓

Rk

(Gweler yr ochr arall am y fersiwn Cymraeg)

64% ✓

Q1

a)

i.

$$A = \begin{bmatrix} 4 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix}$$

Handwritten calculations for the determinant of matrix A:

$$0 + 12 + 0 = 12$$

$$0 + 0 + 6 = 6$$

$$6 - 12 = -6$$

The final result is 4.

Q123/34Q1a14/16

ii

$$C = \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix} = \text{Not Possible}$$

The result is 1.

iii

$$D = \begin{bmatrix} 2 & 4 \\ -3 & 8 \end{bmatrix}$$

Handwritten calculation for the determinant of matrix D:

$$16 - (-12) = 28$$

The result is 2.

iv.

$$AB = \begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix} * \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix} = \begin{bmatrix} 9 & 22 & 4 \\ 9 & 49 & 0 \\ 22 & 20 & 0 \end{bmatrix}$$

$$\begin{array}{ccc} 2 \times 3 & + & 0 \times 2 & + & 3 \times 1 & = & 9 \quad \checkmark \\ 6 & & 0 & & 3 & & \end{array}$$

$$\begin{array}{ccc} 2 \times 0 & + & 0 \times 5 & + & 3 \times 3 & = & 9 \quad \checkmark \\ 0 & & 0 & & 9 & & \end{array}$$

$$\begin{array}{ccc} 2 \times 2 & + & 0 \times 0 & + & 3 \times 6 & = & 22 \quad \checkmark \\ 4 & & 0 & & 18 & & \end{array}$$

$$\begin{array}{ccc} 1 \times 3 & + & 8 \times 2 & + & 3 \times 1 & = & 22 \quad \checkmark \\ 3 & & 16 & & 3 & & \end{array}$$

$$\begin{array}{ccc} 1 \times 0 & + & 8 \times 5 & + & 3 \times 3 & = & 49 \quad \checkmark \\ 0 & & 40 & & 9 & & \end{array}$$

$$\begin{array}{ccc} 1 \times 2 & + & 8 \times 0 & + & 3 \times 6 & = & 20 \quad \checkmark \\ 2 & & 0 & & 18 & & \end{array}$$

$$\begin{array}{ccc} 0 \times 3 & + & 2 \times 2 & + & 0 \times 1 & = & 4 \quad \checkmark \\ 0 & & 4 & & 0 & & \end{array}$$

$$0 \times 0 + 2 \times 0 + 0 \times 3 = 0 \quad \checkmark$$

$$0 \times 2 + 2 \times 0 + 0 \times 6 = 0 \quad \checkmark$$

$$V. \quad BC = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix} \times \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 9 & 14 \\ 12 & -17 \\ 25 & -5 \end{bmatrix}$$

$$3x_1 + 0x_2 + 2x_3 = 9$$

$$3x_4 + 0x_5 + 2x_1 = 14$$

$$2x_1 + 5x_2 + 0x_3 = 12$$

$$2x_4 + 5x_5 + 0x_1 = -17$$

$$1x_1 + 3x_2 + 6x_3 = 25$$

$$1x_4 + 3x_5 + 6x_1 = -5$$

$$Vi. \quad DC = \begin{bmatrix} 2 & 4 \\ -3 & 8 \end{bmatrix} \times \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix} = \text{Not Possible}$$

vii

$$A + D = \begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 6 & 2 & 0 \end{bmatrix} + \begin{bmatrix} 2 & 4 \\ 3 & 8 \end{bmatrix} = \text{Not Possible}$$

b)

$$A = \begin{bmatrix} 2 & 4 & 1 \\ 1 & 4 & 7 \\ 0 & 5 & 2 \end{bmatrix}$$

$0 + 7 + 8 = 78$
 $16 + 0 + 5 = 21$

$$|A| = 21 - 78 = -57$$

$$A = \begin{bmatrix} 2 & 4 & 1 \\ 1 & 4 & 7 \\ 0 & 5 & 2 \end{bmatrix} = \begin{bmatrix} -27 & 2 & 5 \\ 3 & 4 & 10 \\ 24 & 13 & 4 \end{bmatrix}$$

show workings

$$A^{-1} = \frac{1}{-57} \begin{bmatrix} 2 & 4 & 1 \\ 1 & 4 & 7 \\ 0 & 5 & 2 \end{bmatrix} = \begin{bmatrix} -27 & 2 & 5 \\ 3 & 4 & 10 \\ 24 & 13 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix} = \begin{bmatrix} -27 & -2 & 5 \\ -3 & 4 & -10 \\ 24 & -13 & 4 \end{bmatrix}$$



Question No.

Examiner Only

C)

$$3x - 2y + z = 2$$

$$x - 3y + 2z = 1$$

$$2x - y - 3z = -5$$

$$\begin{bmatrix} 3 & -2 & 1 \\ 1 & -3 & 2 \\ 2 & -1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ -5 \end{bmatrix}$$

0.5

$$(-6) + (-6) + 6 = -6$$

$$\begin{bmatrix} 3 & -2 & 1 \\ 1 & -3 & 2 \\ 2 & -1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ -5 \end{bmatrix}$$

✓

1

$$27 + (-8) + (-1) = 18$$

$$= 18 - (-6) = 24$$

$$D = 24$$

G.C.F

replace D to A

$$\begin{bmatrix} 2 & -2 & 1 \\ 1 & -3 & 2 \\ -5 & -1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ -5 \end{bmatrix}$$

0.5

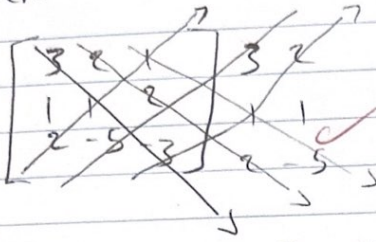
$$15 + (-4) + 6 = 17$$

$$18 + 20 + (-1) = 37$$

$$DX = 37$$

$$37 - 17 = 20$$

replace D to b



$$2 + (-30) + (-6) = -34$$

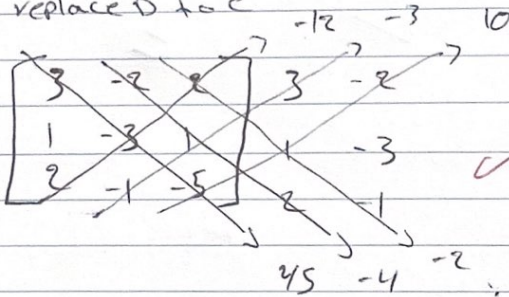
$$-9 + 8 + (-5) = -6$$

$$= -6 + 34 = 28$$

E.C.F

$$Dy = 28$$

replace D to c



$$-12 + (-3) + 10 = -5$$

$$45 + (-4) + (-2) = 39$$

$$= 39 + 5 = 44$$

$$Dz = 44$$

$$Dx = \frac{Dx}{D} = \frac{37}{24} = 1.54$$

E.C.F

$$Dy = \frac{Dy}{D} = \frac{28}{24} = 1.16$$

$$Dz = \frac{Dz}{D} = \frac{44}{24} = 1.83$$

E.C.F

Q2

a)

i

$$(3+4j) + (5+3j)$$

$$z_1 + z_2 = 8 + 7j \quad \underline{\underline{1}}$$

ii

$$2(5+3j) + 3(2+6j)$$

$$(10+6j) + (6+18j)$$

$$16 + 24j \quad \underline{\underline{2}}$$

iii

$$(3+4j)^2 + (2+6j) \quad \checkmark$$

$$(3+4j)(3+4j) + (2+6j) \quad \checkmark$$

$$(9+12j+12j+16j^2) + (2+6j) \quad \checkmark$$

$$(9+24j+16(-1)) + (2+6j) \quad \checkmark$$

$$(9+24j-16) + (2+6j) \quad \checkmark$$

$$(-7+24j) + (2+6j) \quad \checkmark$$

$$-5 + 30j \quad \underline{\underline{3}}$$

Q228/34Q2a15/18

iv. $(3+4j)(5+3j)(2+6j)$

$$(3+4j)(10+30j+6j+18j^2)$$

$$(3+4j)(10+36j+18(-1))$$

$$(3+4j)(10+36j-18)$$

$$(3+4j)(-8+36j)$$

$$-24+108j+32j+144j^2$$

$$-24+76j-144$$

$$-168+76j$$

v.

vi. $\frac{(3+4j)}{(5+3j)} \times \frac{(5-3j)}{(5-3j)}$

$$\frac{15-9j+20j-12j^2}{25-15j+15j-9j^2} = \frac{15+11j-12(-1)}{25-9(-1)} = \frac{15+11j+12}{25+9}$$

$$= \frac{27+11j}{34} = \frac{27}{34} + \frac{11j}{34}$$

b)

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

$$a = 5, b = -8, c = 5$$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(5)(5)}}{2(5)} = \frac{8 \pm \sqrt{36}}{10} = 0.8 \pm 3.6j$$

$$\text{or } \frac{8 - \sqrt{36}}{10} = 0.8 - 3.6j$$

$$x = 0.8 + 3.6j \text{ E.C.F.}$$

$$|z| = \sqrt{a^2 + b^2}$$

$$= \sqrt{(0.8)^2 + (3.6)^2}$$

$$= \sqrt{0.64 + 12.96}$$

correct method

$$r = 3.68 \text{ E.C.F.}$$

$$\theta = \tan^{-1}\left(\frac{b}{a}\right)$$

$$\tan^{-1} \frac{3.6}{0.8}$$

correct method

$$\theta = 77.47^\circ \text{ E.C.F.}$$

Polar form

$$3.68 \angle 77.47^\circ$$

E.C.F.

$$x = 0.8 - 3.6j$$

$$|z| = \sqrt{a^2 + b^2}$$

$$|z| = \sqrt{(0.8)^2 + (-3.6)^2}$$

$$= \sqrt{0.64 + 12.96}$$

E.C.F.

$$|z| = r = 3.68$$

$$\theta = \tan^{-1}\left(\frac{b}{a}\right)$$

$$\theta = \tan^{-1}\left(\frac{3.6}{0.8}\right)$$

$$\theta = 77.47^\circ$$

Polar form

$$3.68 \angle 77.47^\circ$$

$$C = (3+4j)^4$$

$$|z| = \sqrt{a^2 + b^2} \quad \checkmark$$

$$= \sqrt{3^2 + 4^2} = \sqrt{9+16} = \sqrt{25} = 5 \quad \checkmark$$

$$|z| = r = 5 \quad \checkmark \quad \underline{\underline{5}}$$

$$\theta = \tan^{-1}\left(\frac{b}{a}\right) \quad \checkmark$$

$$= \tan^{-1}\left(\frac{4}{3}\right) \quad \checkmark$$

$$\theta = 53.13^\circ \quad \checkmark \quad \underline{\underline{53.13^\circ}}$$

Polar form

$$\sqrt{25} \angle 53.13^\circ \quad \checkmark$$

$$(3+4j)^4 = (\sqrt{25})^4 \left(\cos(4)(53.13) + j \sin(4)(53.13) \right) \quad \checkmark \quad \underline{\underline{3}}$$

$$= 625 (\cos(212.5) + j \sin(212.5)) \quad \checkmark$$

$$= 625 (-0.8 + j0.5) \quad \checkmark \quad \underline{\underline{1}}$$

$$= -500 - 312.5j \quad \checkmark \quad \underline{\underline{1}}$$

Q2c

7/7

Q3

Q3

a

13/32

i

$$\int (25x^4 + 12x^2 + 6x - 10) dx$$

Q3a

$$\frac{25x^5}{5} + \frac{12x^3}{3} + \frac{6x^2}{2} - 10x$$

9/18

$$5x^5 + 4x^3 + 3x^2 - 10x + C \quad \underline{4}$$

ii

$$\int (\sin 7x + 6 \cos 3x + 5e^{5x}) dx$$

$$-\frac{1}{7} \cos 7x + \frac{6}{3} \sin 3x + 25e^{5x} + C \quad \underline{2}$$

V.

$$\int_1^5 (2x^3 + 5x^2 + 3x - 9) dx$$

~~$$\int_1^5 (2x^3 + 5x^2 + 3x - 9) dx$$~~

$$\left[\frac{2x^4}{4} + \frac{5x^3}{3} + \frac{3x^2}{2} - 9x \right]_1^5$$

$$\left[\frac{2(5)^4}{4} + \frac{5(5)^3}{3} + \frac{3(5)^2}{2} - 9(5) \right] - \left[\frac{2(1)^4}{4} + \frac{5(1)^3}{3} + \frac{3(1)^2}{2} - 9(1) \right]$$

$$\left[312.5 + 208.3 + 37.5 - 45 \right] - \left[0.5 + 1.66 + 1.5 - 9 \right]$$

$$3413.3 + 5.34$$

$$= 3418.6$$

x

$$b) \int x^2 (4x^3 + 9)^5 dx$$

$$u = 4x^3 + 9$$

$$du = 12x^2 dx$$

$$\int x^2 (u)^5 \frac{du}{12x^2}$$

$$dx = \frac{du}{12x^2}$$

$$12 \int u^5 du$$

$$12 \cdot \frac{u^6}{6} + C$$

$$12 \cdot \frac{(4x^3 + 9)^6}{6} + C$$

Q3b

4/6

Q3c

0/8