



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: ISAAC

FORENAME(S): CHRISTOPHER

Huw.

1	Student Number	7837
2	Title of Examination Paper	maths Test 2.
3	Module Code	90EN4001
4	Date and Time of Examination	19-5-25
5	Examination Venue	main Hall, Tycho
6	Seat Number	D1
7	Number of Answer Books handed in	1.

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

56
L2

56%

I, det of A =

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

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

$$= 6 - 12 = -6$$

$$0 \ 0 \ 6$$

(4)

$$\begin{array}{r} 21 \\ 32 \\ \hline 34 \end{array}$$

II, det of C

$$\begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix}$$

det not possible

(1)

$$\begin{array}{r|l} a & 16 \\ b & 9 \\ c & 7 \end{array}$$

III, det of D

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

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

$$-12$$

$$16$$

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

(2)

IV, AB

$$\begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix} \times \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix}$$

(4)

$$2 \times 3 + 0 \times 2 + 3 \times 1 = 9$$

$$2 \times 0 + 0 \times 5 + 3 \times 3 = 9$$

$$2 \times 2 + 0 \times 0 + 3 \times 6 = 22$$

$$1 \times 3 + 8 \times 2 + 3 \times 1 = 22$$

$$1 \times 0 + 8 \times 5 + 3 \times 3 = 49$$

$$1 \times 2 + 8 \times 0 + 3 \times 6 = 20$$

$$0 \times 3 + 2 \times 2 + 0 \times 1 = 4$$

$$0 \times 0 + 2 \times 5 + 0 \times 3 = 10$$

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

$$\begin{bmatrix} 9 & 9 & 22 \\ 22 & 49 & 20 \\ 4 & 10 & 0 \end{bmatrix}$$

V, BC

$$\begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix} \times \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix}$$

(3)

$$3 \times 1 + 0 \times 2 + 2 \times 3 = 9$$

$$3 \times 4 + 0 \times -5 + 2 \times 1 = 14$$

$$2 \times 1 + 5 \times 2 + 0 \times 3 = 12$$

$$2 \times 4 + 5 \times -5 + 0 \times 1 = -17$$

$$1 \times 1 + 3 \times 2 + 6 \times 3 = 25$$

$$1 \times 4 + 3 \times -5 + 6 \times 1 = -5$$

$$\begin{bmatrix} 9 & 14 \\ 12 & -17 \\ 25 & -5 \end{bmatrix}$$

✓

VI, DC

$$\begin{bmatrix} 2 & 4 \\ -3 & 8 \end{bmatrix} \times \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix}$$

= Not Possible ✓

(1)

VII, A + D.

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

= Not Possible ✓

(1)

b, Inverse matrix $0 \cdot 708 = 78$.

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

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

$$16 \cdot 0 \cdot 5 = 21$$

$$\begin{bmatrix} 4 & 7 \\ 5 & 2 \end{bmatrix} \quad 4 \times 2 - 5 \times 7 = -27$$

$$\begin{bmatrix} 1 & 7 \\ 0 & 2 \end{bmatrix} \quad 1 \times 2 - 0 \times 7 = 2$$

$$\begin{bmatrix} 1 & 4 \\ 0 & 5 \end{bmatrix} \quad 1 \times 5 - 0 \times 4 = 5$$

$$\begin{bmatrix} 4 & 1 \\ 5 & 2 \end{bmatrix} \quad 4 \times 2 - 5 \times 1 = 3$$

$$\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix} \quad 2 \times 2 - 0 \times 1 = 4$$

$$\begin{bmatrix} 2 & 4 \\ 0 & 5 \end{bmatrix} \quad 2 \times 5 - 0 \times 4 = 10$$

$$\begin{bmatrix} 4 & 1 \\ 4 & 7 \end{bmatrix} \quad 4 \times 7 - 4 \times 1 = 24$$

$$\begin{bmatrix} 2 & 1 \\ 1 & 7 \end{bmatrix} \quad 2 \times 7 - 1 \times 1 = 13$$

$$\begin{bmatrix} 2 & 4 \\ 1 & 4 \end{bmatrix} \quad 2 \times 4 - 1 \times 4 = 4$$

$$-27 \quad 2 \quad 5$$

Question No.

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

$$\text{Adj } A = \begin{bmatrix} 0.473 & 0.0526 & -0.421 \\ 0.035 & -0.07 & 0.228 \\ -0.087 & 0.1754 & -0.07 \end{bmatrix} ?$$

$$A^{-1} = \frac{1}{-57} \cdot \begin{bmatrix} 0.473 & 0.0526 & -0.421 \\ 0.035 & -0.07 & 0.228 \\ -0.087 & 0.1754 & -0.07 \end{bmatrix} ?$$

C Cramers rule.

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

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

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

⑦

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

✓

$$\begin{array}{ccc} & -6 & 6 & 6 & = & 6 \\ \begin{bmatrix} 3 & -2 & 1 \\ 1 & -3 & 2 \\ 2 & 1 & -3 \end{bmatrix} & \begin{bmatrix} 3 & -2 \\ 1 & -3 \\ 2 & 1 \end{bmatrix} & \begin{bmatrix} 3 & -2 \\ 1 & -3 \\ 2 & 1 \end{bmatrix} & \end{array}$$

$$\Delta = 20 - 6 = 14$$

✓

$$27 - 8 = 20$$

$$15 - 4 - 6 = 25$$

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

$$\Delta x = 39 - 25 = 14$$

✓

$$18 - 20 = 1$$

$$2 - 30 - 6 = -34$$

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

$$\Delta y = -6 - -34 = 28$$

✓

$$-9 - 8 - 5 = -6$$

$$-12 - 3 - 10 = 1$$

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

$$\Delta z = 43 - 1 = 42$$

$$45 - 4 - 2 = 43$$

Question No.

Examiner Only

$$x = \frac{14}{14} = 3.5 \quad ? \quad \times$$

$$y = \frac{28}{14} = 2 \quad \checkmark$$

$$z = \frac{42}{14} = 3 \quad \checkmark$$

Arholwr yn unig

Phily Gwestiwn

i, $Z_1 + Z_2$

$$= 3 + 4j + 5 + 3j = 8 + 7j$$

(1)

Q2

21

34

ii, $2Z_2 + 3Z_3$

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

(2)

$$= 10 + 6j + 6 + 18j = 16 + 24j$$

iii, $Z_1^2 + Z_3$

$$= (3 + 4j)(3 + 4j) + (2 + 6j)$$

$$(9 + 12j + 12j - 16) + 2 + 6j$$

$$(-7 + 24j) + 2 + 6j = -5 + 30j$$

(3)

Q1 15

6 4

Q2

iv, $Z_1 Z_2 Z_3$

$$= (3 + 4j)(5 + 3j)(2 + 6j)$$

$$(15 + 9j + 20j - 12)(2 + 6j)$$

$$(3 + 29j)(2 + 6j)$$

$$6 + 18j + 58j - 174 = -168 + 76j$$

(4)

V_1 ~~X~~

$$V_1, \frac{Z_1}{Z_2} = \frac{3+4j}{5+3j} = \frac{3+4j}{5+3j} \times \frac{5-3j}{5-3j}$$

$$= \frac{15-9j+20j+12}{25-15j+15j+9} = \frac{27+11j}{34}$$

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

(5)

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

$$b, 5x^2 - 8x + 5 = 0$$

$$A = 5$$

$$B = -8$$

$$C = 5$$

$$= \frac{-(-8) \pm \sqrt{(-8)^2 - 4(5)(5)}}{2(5)}$$

$$= \frac{4 + 3j}{5}$$

$$= 0.8 + 0.6j$$

$$= \frac{4 - 3j}{5}$$

$$= 0.8 - 0.6j$$

(4)

C $(3 + 4j)^4$

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

$$\phi = \tan^{-1} \frac{4}{3} = 53.130^\circ$$

(2)

$$= 5 (\cos 53.130^\circ + j \sin 53.130^\circ)$$

1666031

$$= 5^4 (5 \cos 53.130^\circ + j 5 \sin 53.130^\circ)$$

~~265.65~~

$$1, \int (25x^4 + 12x^3 + 6x - 10) dx$$

$$= \frac{25x^5}{5} + \frac{12x^3}{3} + \frac{6x^2}{2} + C$$

(3)

Q3
3
32

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

$$= 518.66$$

show your workings

a	3
b	0
c	0