



Prifysgol Cymru
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University of Wales
Trinity Saint David

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.**

Complete, fold and seal
(see note 2 below)

SURNAME: Pagett

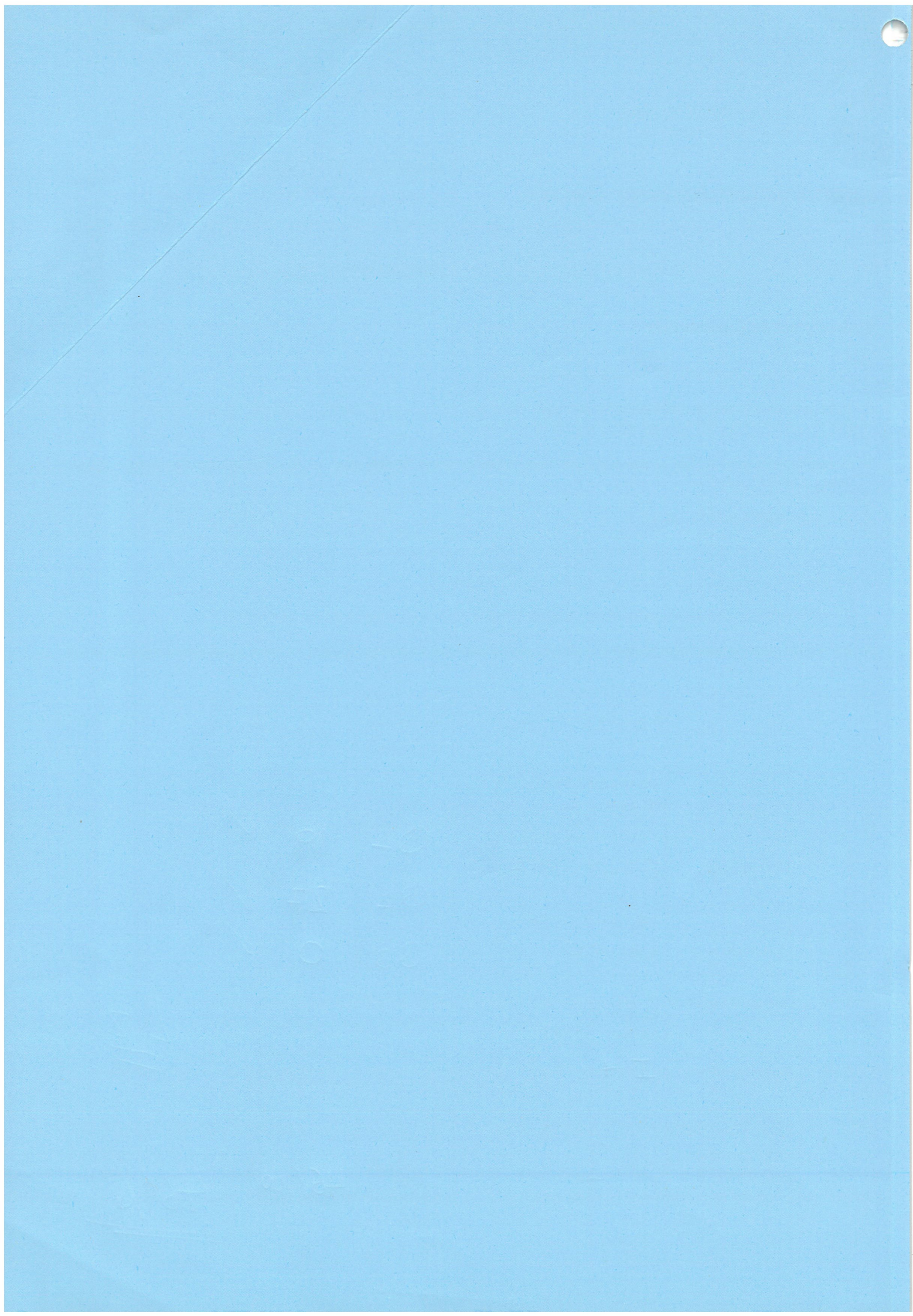
FORENAME(S): Kai

1	Student Number	PAG 22870042
2	Title of Examination Paper	Mathematics Test 2
3	Module Code	GOEN 4001
4	Date and Time of Examination	18/05/2026 14:00
5	Examination Venue	68860 Main hall
6	Seat Number	I 4
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
Q1	19 ✓
Q2	27 ✓
Q3	0 ✓
Total	46/100

L2

460%



Q1)

$$a) z_1 = 3 + 7j, z_2 = 4 + 5j, z_3 = 2 + 6j$$

$$1) z_1 + z_2$$

$$(3 + 7j) + (4 + 5j) = 7 + 12j$$

$$2) z_2 + 3z_3$$

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

$$(4 + 5j) + (6 + 18j) = 10 + 23j$$

$$3) z_2^2 + z_3$$

$$(3 + 7j)(3 + 7j) + (2 + 6j)$$

$$(9 + 21j + 21j + 49j^2) + (2 + 6j)$$

$$(9 + 42j - 49) + (2 + 6j)$$

$$(-40 + 42j) + (2 + 6j) = -38 + 48j$$

$$4) z_1 z_2 z_3$$

$$(3 + 7j)(4 + 5j)(2 + 6j)$$

$$~~(3 + 7j)(4 + 5j)~~ = (12 + 15j + 28j + 35j^2)(2 + 6j)$$

$$= (12 + 43j - 35)(2 + 6j)$$

$$= (-23 + 43j)(2 + 6j)$$

$$= (-46 - 138j + 86j + 256j^2)$$

$$= (-46 - 52j - 256)$$

$$= -302 - 52j$$

Q119/33Q1a15/184

q1)

a)

$$5) \frac{Z_1}{Z_2} = \frac{3+7j}{4+5j}$$

$$\frac{(3+7j)}{(4+5j)} \times \frac{(4-5j)}{(4-5j)} = \frac{(12-15j+28j-35j^2)}{(16-20j+20j-25j^2)}$$

$$= \frac{(12+13j+35)}{(16+25)}$$

$$= \frac{47+13j}{41}$$

$$= \frac{47}{41} + \frac{13}{41}j$$

$$6) \frac{Z_1 Z_1 - Z_2 Z_2}{Z_1 Z_1 - Z_1 Z_2}$$

$$= 1 - \frac{Z_2 Z_2}{Z_1 Z_2}$$

Q1)

b)

$$2x^2 - 6x + 9 = 0$$

$$\begin{matrix} \nearrow & \nearrow & \nearrow \\ a & b & c \end{matrix}$$

$$\frac{-b \pm \sqrt{(b)^2 - 4(a)(c)}}{2(a)}$$

$$\frac{6 \pm \sqrt{(-6)^2 - 4(2)(9)}}{2(2)}$$

Math error

$$\frac{6 \pm \sqrt{(36) - 4(18)}}{4}$$

$$\frac{6 \pm \sqrt{(36) - 72}}{4}$$

$$\frac{6 \pm \sqrt{-36}}{4}$$

$$\frac{6 + 6j}{4} = \cancel{3} \cancel{3} \frac{3}{2} + \frac{3}{2} j$$

or

$$\frac{6 - 6j}{4} = \frac{3}{2} - \frac{3}{2} j$$

$$x = 1.5 + 1.5j$$

$$|1.5 + 1.5j| = \sqrt{(1.5)^2 + (1.5)^2}$$

$$= 2.12$$

$$\tan^{-1}(\quad) \quad ??$$

?

Q1b4/94Q1c0/6

Q2)

$$a) A = \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 5 \\ 2 & -2 \\ 1 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 5 & 4 \\ -2 & 6 \end{bmatrix} \quad D = \begin{bmatrix} 0 & 2 & 2 \\ 3 & 5 & 1 \\ 5 & 1 & 4 \end{bmatrix}$$

1) The determinant of A

$$\begin{aligned} \begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} &= 1(5 \times 6 - 4 \times 2) - 3(0 \times 6 - 4 \times 5) + 3(0 \times 2 - 5 \times 5) \\ &= 1(30 - 8) - 3(0 - 20) + 3(0 - 25) \\ &= 1(22) - 3(-20) + 3(-25) \\ &= 22 + 60 - 75 \\ &= 7 \end{aligned}$$

E.C.F

2) The determinant of C

$$\begin{aligned} \begin{bmatrix} 5 & 4 \\ -2 & 6 \end{bmatrix} &= (5 \times 6) - (4 \times -2) \\ &= 30 - (-8) \\ &= 38 \end{aligned}$$

3) A B

$$\begin{bmatrix} 1 & 3 & 3 \\ 0 & 5 & 4 \\ 5 & 2 & 6 \end{bmatrix} \begin{bmatrix} 3 & 5 \\ 2 & -2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 12 & 2 \\ 14 & -6 \\ 25 & 27 \end{bmatrix}$$

$$\begin{array}{rcl} 1 \times 3 & = & 3 \\ 3 \times 2 & = & 6 \\ 3 \times 1 & = & 3 \\ \hline & & 12 \end{array} \quad \begin{array}{rcl} 1 \times 5 & = & 5 \\ 3 \times -2 & = & -6 \\ 3 \times 1 & = & 3 \\ \hline & & 2 \end{array}$$

$$\begin{array}{rcl} 0 \times 3 & = & 0 \\ 5 \times 2 & = & 10 \\ 4 \times 1 & = & 4 \\ \hline & & 14 \end{array} \quad \begin{array}{rcl} 0 \times 5 & = & 0 \\ 5 \times -2 & = & -10 \\ 4 \times 1 & = & 4 \\ \hline & & -6 \end{array}$$

$$\begin{array}{rcl} 5 \times 3 & = & 15 \\ 2 \times 2 & = & 4 \\ 6 \times 1 & = & 6 \\ \hline & & 25 \end{array} \quad \begin{array}{rcl} 5 \times 5 & = & 25 \\ 2 \times -2 & = & -4 \\ 6 \times 1 & = & 6 \\ \hline & & 27 \end{array}$$

$$= \begin{bmatrix} 12 & 2 \\ 14 & -6 \\ 25 & 27 \end{bmatrix}$$

Q2

27/33

Q2a

11/17

q2)

4) AD

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

$$\begin{array}{l} 1 \times 0 = 0 \\ 3 \times 3 = 9 \\ 3 \times 5 = 15 \\ \hline 24 \end{array} \quad \begin{array}{l} 1 \times 2 = 2 \\ 3 \times 5 = 15 \\ 3 \times 1 = 3 \\ \hline 20 \end{array} \quad \begin{array}{l} 1 \times 2 = 2 \\ 3 \times 1 = 3 \\ 3 \times 4 = 12 \\ \hline 17 \end{array}$$

$$\begin{array}{l} 0 \times 0 = 0 \\ 5 \times 3 = 15 \\ 4 \times 5 = 20 \\ \hline 35 \end{array} \quad \begin{array}{l} 0 \times 2 = 0 \\ 5 \times 5 = 25 \\ 4 \times 1 = 4 \\ \hline 29 \end{array} \quad \begin{array}{l} 0 \times 2 = 0 \\ 5 \times 1 = 5 \\ 4 \times 4 = 16 \\ \hline 21 \end{array}$$

$$\begin{array}{l} 5 \times 0 = 0 \\ 2 \times 3 = 6 \\ 6 \times 5 = 30 \\ \hline 36 \end{array} \quad \begin{array}{l} 5 \times 2 = 10 \\ 2 \times 5 = 10 \\ 6 \times 1 = 6 \\ \hline 26 \end{array} \quad \begin{array}{l} 5 \times 2 = 10 \\ 2 \times 1 = 2 \\ 6 \times 4 = 24 \\ \hline 36 \end{array}$$

$$= \begin{bmatrix} 24 & 20 & 17 \\ 35 & 29 & 21 \\ 36 & 26 & 36 \end{bmatrix}$$

4

5) CD

Not possible

1

92)
B)

$$A = \begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix}$$

Q2b

$$6(0 \times 3 - 5 \times 2) - 3(2 \times 3 - 5 \times 4) + 1(2 \times 2 - 0 \times 4)$$

$$6(0 - 10) - 3(6 - 20) + 1(4 - 0)$$

$$6(-10) - 3(-14) + 1(4)$$

$$-60 + 42 + 4 = -14$$

10/10

$$\begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} (0 \times 3) - (5 \times 2) = -10$$

$$\begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} (3 \times 3) - (1 \times 2) = 9 - 2 = 7$$

$$\begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} (3 \times 5) - (1 \times 0) = 15$$

$$\begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} (2 \times 3) - (5 \times 4) = 6 - 20 = -14$$

$$\begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} (6 \times 3) - (1 \times 4) = 18 - 4 = 14$$

$$\begin{bmatrix} 6 & 3 & 1 \\ 2 & 0 & 5 \\ 4 & 2 & 3 \end{bmatrix} (6 \times 5) - (1 \times 2) = 30 - 2 = 28$$

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

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

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

$$= \begin{bmatrix} -10 & -14 & 4 \\ 7 & 14 & 0 \\ 15 & 28 & -6 \end{bmatrix}$$

6

92) B)
$$= \begin{bmatrix} -10 & -14 & 4 \\ 7 & 14 & 0 \\ 15 & -28 & -6 \end{bmatrix} \rightarrow \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix} = \begin{bmatrix} -10 & 14 & 4 \\ -7 & 14 & -0 \\ 15 & -28 & -6 \end{bmatrix}$$

$$\text{Adj} = \begin{bmatrix} -10 & -7 & 15 \\ 14 & 14 & -28 \\ 4 & -0 & -6 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-14} = \begin{bmatrix} -10 & -7 & 15 \\ 14 & 14 & -28 \\ 4 & -0 & -6 \end{bmatrix}$$

C)
$$\begin{aligned} 2x - y - z &= -2 \\ -x + y + z &= 0 \\ x - 2y + z &= 8 \end{aligned}$$

$$\begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix}$$

$$\begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$\begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 1 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$\begin{aligned} 2(1 \times 1 - 1 \times 2) - 1(-1 \times 1 - 1 \times 1) - 2(-1 \times 2 - 1 \times 1) \\ 2(1 + 2) + 1(-1 - 1) - 2(2 - 1) \\ 2(3) + 1(-2) - 2(1) \\ 6 - 2 - 2 = 2 \end{aligned}$$

$$\begin{bmatrix} -2 & -1 & -2 \\ 0 & 1 & 1 \\ 8 & -2 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$\begin{aligned} -2(1 \times 1 - 1 \times 2) - 1(0 \times 1 - 1 \times 8) - 2(0 \times 2 - 1 \times 8) \\ -2(1 + 2) + 1(-8) - 2(-8) \\ -2(3) + 1(-8) - 2(-8) \\ -6 - 8 + 16 = -2 \end{aligned}$$

$$\begin{bmatrix} 2 & -2 & -2 \\ -1 & 0 & 1 \\ 1 & 8 & 1 \end{bmatrix} \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$\begin{aligned} 2(0 \times 1 - 1 \times 8) - 2(-1 \times 1 - 1 \times 1) - 2(-1 \times 8 - 0 \times 1) \\ 2(-8) + 2(-1 - 1) - 2(-8) \\ 2(-8) + 2(-2) - 2(-8) \\ -16 - 4 + 16 = -4 \end{aligned}$$

$$\begin{bmatrix} 2 & -1 & -2 \\ -1 & 1 & 0 \\ 1 & -2 & 8 \end{bmatrix} \begin{bmatrix} -2 \\ 0 \\ 8 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$\begin{aligned} 2(1 \times 8 - 0 \times 2) - 1(-1 \times 8 - 0 \times 1) - 2(-1 \times 2 - 1 \times 1) \\ 2(8) + 1(-8) - 2(2 - 1) \\ 2(8) + 1(-8) - 2(1) \\ 16 - 8 - 2 = 6 \end{aligned}$$

Q2b

Q2c

6/6

Q2

$$c) x = \frac{2}{2} = 1 \quad \checkmark$$

$$y = \frac{-24}{2} = -12 \quad \checkmark$$

$$z = \frac{6}{2} = 3 \quad \checkmark$$

Q30/34

Cyfarwyddiadau i Ymgeiswyr

12 Tudalen

2. Rhwch eich enw yn lle a ddarparwyd ar y dde, plygchwch et a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) !

- gael ei theipio a chael yr ymgeisydd i dalu.

4. Ysgrifennwch eich atebion mewn inc.

5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.

6. Ni ddylid rhwgo unrhyw ran o'r llyfr hwn; rhaid ei gyflwyno yn gyfan.

7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwylwtr/gwylwtr.

8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

1	Rhif Myfyriwr	
2	Teitl y Papur Arholiad	
3	Cod y Modwl	
4	Dyddiad ac Amser yr Archoliad	
5	Lleoliad yr Arholiad	
6	Rhif Sedd	
7	Nifer y Llyfrau Atebion a gyflwynwyd	

[illegible]

(See the other side for English version)

Llenwch, plygwh a selwch
(gweler nodyn 2 isod)

CYFENW:

ENW(AU) CYNTAF:

ENW(AU) CYNTAF: