



12 Pages

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(see note 2 below)

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1	Student Number	COF 17838420
2	Title of Examination Paper	Mathematics
3	Module Code	GOEN4001
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6	Seat Number	
7	Number of Answer Books handed in	1

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

27

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41%

1) a) i) $\begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 1 & 8 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 0 \\ 3 & 6 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 12 \\ 3 & 0 \end{bmatrix}$

$5 - 12 = -6 \therefore \det A = -6$ (4)

a) ii) Not possible as Matrix is not equal on both sides (1)

a) iii) $2 \times 8 = 16, 4 \times -3 = -12, 16 + 12 = 28 \therefore \det D = 28$ (2)

a) iv) $A = \begin{bmatrix} 2 & 0 & 3 \\ 1 & 8 & 3 \\ 0 & 2 & 0 \end{bmatrix} \times B = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix} = \begin{bmatrix} 9 & 9 & 22 \\ 22 & 49 & 20 \\ 4 & 10 & 0 \end{bmatrix}$

$3 \times 1 = 3, 0 \times 2 = 0, 2 \times 3 = 6, \therefore 6 + 3 = 9$

$3 \times 3 = 9, 0 \times 5 = 0, 2 \times 0 = 0, \therefore = 9$

~~$3 \times 6 = 18, 2 \times 2 = 4, 1 \times 3 = 3, \therefore 18 + 4 + 3 = 25$~~

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

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

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

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

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

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

a) v) $B = \begin{bmatrix} 3 & 0 & 2 \\ 2 & 5 & 0 \\ 1 & 3 & 6 \end{bmatrix} \times C = \begin{bmatrix} 1 & 4 \\ 2 & -5 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 9 & 14 \\ 12 & -17 \\ 25 & -5 \end{bmatrix}$

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

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

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

~~$0 \times 6 + 5 \times 0 + 2 \times 6 = 12$~~

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

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

a) vi) ~~$A + D$ can't do in~~ Not possible (1)

vi not possible (1)

Q1

18/34

a) 16

b) 2

c) 0

$$A = \begin{bmatrix} 2 & 4 & 1 & 2 & 4 \\ 1 & 4 & 7 & 1 & 4 \\ 0 & 5 & 2 & 0 & 5 \end{bmatrix} \quad \begin{array}{l} 1 \setminus 16 \\ 2 \setminus 0 \\ 3 \setminus 5 \end{array} \quad \begin{array}{l} 1/0 \\ 2/70 \\ 3/8 \end{array} \quad \frac{1}{-57}$$

$$21 - 78 = -57 \therefore \det = -57$$

$$4 \times 2 + 5 \times 7 = 43$$

$$7 \times 0 + 1 \times 2 = 2$$

$$1 \times 5 + 4 \times 0 = 5$$

$$4 \times 2 + 1 \times 5 = 13$$

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

$$2 \times 5 + 4 \times 0 = 10$$

$$4 \times 7 + 4 \times 1 = 32$$

$$2 \times 7 + 1 \times 1 = 15$$

$$2 \times 4 + 1 \times 4 = 12$$

$$\begin{bmatrix} 43 & 2 & 5 \\ 13 & 4 & 10 \\ 32 & 15 & 12 \end{bmatrix}$$

$$\frac{1}{-57} \begin{bmatrix} 43 & -2 & 5 \\ 13 & 4 & -10 \\ 32 & -15 & 12 \end{bmatrix}$$

$$= \begin{bmatrix} 0.75 & -0.035 & 0.088 \\ -0.23 & 0.07 & -0.175 \\ 0.56 & -0.26 & 0.21 \end{bmatrix}$$

2)

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

$$\frac{-8 \pm \sqrt{8^2 - 4 \times 5 \times 5}}{2 \times 5} = \frac{-4 \pm 3j}{5}, \frac{-4 - 3j}{5}$$

$$\theta = \pm 143.13^\circ$$

1)

$$C = \begin{bmatrix} 3 & 2 & 2 & 3 & 2 \\ 3 & 2 & 1 & 3 & 2 \\ 2 & 3 & 5 & 2 & 3 \end{bmatrix} \quad \begin{array}{l} 1 \setminus 30 \\ 2 \setminus 4 \\ 3 \setminus 18 \end{array} \quad \begin{array}{l} 1/8 \\ 2/9 \\ 3/30 \end{array} \quad \frac{1}{5}$$

$$52 - 47 = 5 \therefore \det = 5$$

Q2

15/34

a) 15

b) 0

c) 0

2)

a)

i

$$8+7j$$

ii

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

$$2 \times 5 = 10, 2 \times 3j = 6j, 3 \times 2 = 6, 3 \times 6j = 18j$$

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

$$= 16+24j$$

iii

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

$$(3+4j)(3+4j) = (-7+24j)$$

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

iv

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

$$(3+4j)(5+3j) = (3+29j)$$

$$(3+29j)(2+6j) = -168+76j$$

v.

vi

$$\frac{(3+4j)(5-3j)}{(5+3j)(5-3j)} = \frac{(27+11j)}{(34+0)} = \frac{27}{34} + \frac{11}{34}j$$

b) On Page before ←

$$c) \sqrt{3^2+4^2} = \sqrt{5} = 2.23$$

3)

a)

X

$$i) \int \frac{25x^5}{5} + \frac{12x^3}{3} + \frac{6x^2}{2} + C \quad \checkmark \quad (4)$$

$$ii) \int -\frac{1}{7} \cos 7x + \frac{1}{6} \sin 6x + \frac{1}{5} 5e^{5x} + C \quad (2)$$

$$V. \int_1^5 [2x^3 + 5^2 + 3x - 9]$$

$$iv) \ln(15) = \ln(15) + \ln\left(\frac{e^3}{3}\right) + C \quad X$$

$$c) u = 5x, v = e^{5x}, du = \frac{5x^2}{2}, dv = \frac{1}{5}e^{5x} \quad (1)$$

$$\int 5x \times \frac{1}{5}e^{5x} - e^{5x} \times \frac{5x^2}{2} + C$$

$$b) u = 4x^3 + 9, \frac{du}{dx} = \frac{4x^4}{4}, du = 4x^4, dx = 4 \quad (1)$$

Q3

8/32

a) 6

b) 1

c) 1