

ACDA 4008 PAPER 1 Solutions

(For EEE) (2024 Sem 2)

Q1 (i) $\cancel{x} + \cancel{2y} - \cancel{5z} - \cancel{3x} - \cancel{9y} + \cancel{3z} + \cancel{2x} - \cancel{5y} + z$
 $= \underline{0x - 12y - z}$ [5]

(ii) $x(x+2) - x(x-3)$
 $= x^2 + 2x - x^2 + 3x$
 $= \underline{5x}$ [5]

(iii) $p^2 q^1 r^1 \times 4 p^1 q^3 \times 6 q^1 r^2$
 $= \underline{24 p^3 q^5 r^3}$ [5]

(iv) $\frac{12 p^5 q^1 r^1}{6 p^1 q^3 r^{-3}} = 2 p^4 q^{-2} r^4$ [5]

(v) $\frac{f g}{16 h} \times \frac{g h^2}{f h} \times \frac{\cancel{32} f h^3}{\cancel{72} f^3}$
 $= \frac{f^2 g^2 h^5}{f^4 h^2} = \underline{f^{-2} g^2 h^3}$ [5]

Q.2 i) $3(x+2) = 2(x-3)$

$$3x + 6 = 2x - 6$$

$$3x - 2x = -6 - 6$$

$$\underline{x = -12}$$

[8]

ii) $\frac{(x-3)}{4} = \frac{(3x+4)}{8}$

Multiply both sides by 8 $\Rightarrow$

$$\frac{8(x-3)}{4} = \frac{8(3x+4)}{8}$$

$$2(x-3) = 3x+4$$

$$2x - 6 = 3x + 4$$

$$-6 - 4 = 3x - 2x$$

$$\underline{-10 = x.}$$

[12]

Q.3

$$3x + 2y = 10 \quad \text{--- (1) } \times 3$$

$$2x - 3y = -2 \quad \text{--- (2) } \times 2$$

$$9x + 6y = 30 \quad \text{--- (3)}$$

$$4x - 6y = -4 \quad \text{--- (4)}$$

$$\text{ADD} \quad 13x \quad \quad = 26$$

$$\Rightarrow x = \frac{26}{13}$$

$$\underline{x = 2}$$

Substitute $x=2$ into (1)

$$3(2) + 2y = 10$$

$$6 + 2y = 10$$

$$2y = 10 - 6$$

$$2y = 4$$

$$y = \frac{4}{2}$$

$$\underline{y = 2}$$

[10]

Q.4

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 2 \\ 3 & 2 & 1 \end{bmatrix} \begin{bmatrix} + & - & + \\ - & + & - \\ + & - & + \end{bmatrix}$$

$$|A| = +1 \begin{vmatrix} -1 & 2 \\ 2 & 1 \end{vmatrix} - 2 \begin{vmatrix} 2 & 2 \\ 3 & 1 \end{vmatrix} + 3 \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix}$$

$$= 1[-1-4] - 2[2-6] + 3[4-(-3)]$$

$$= 1[-5] - 2[-4] + 3[7]$$

$$= -5 + 8 + 21$$

$$|A| = 24$$

The Determinant of Matrix A is 24

[7]

The Cofactor Matrix:

$$C = \begin{bmatrix} + \begin{vmatrix} -1 & 2 \\ 2 & 1 \end{vmatrix} - \begin{vmatrix} 2 & 2 \\ 3 & 1 \end{vmatrix} + \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} \\ - \begin{vmatrix} 2 & 3 \\ 2 & 1 \end{vmatrix} + \begin{vmatrix} 1 & 3 \\ 3 & 1 \end{vmatrix} - \begin{vmatrix} 1 & 2 \\ 3 & 2 \end{vmatrix} \\ + \begin{vmatrix} 2 & 3 \\ -1 & 2 \end{vmatrix} - \begin{vmatrix} 1 & 3 \\ 2 & 2 \end{vmatrix} + \begin{vmatrix} 1 & 2 \\ 2 & -1 \end{vmatrix} \end{bmatrix}$$

$$C = \begin{bmatrix} -5 & 4 & 7 \\ 4 & -8 & 4 \\ 7 & +4 & -5 \end{bmatrix}$$

Transpose of $C \Rightarrow$

$$C^T = \begin{bmatrix} -5 & 4 & 7 \\ 4 & -8 & 4 \\ 7 & 4 & -5 \end{bmatrix}$$

$$A^{-1} = \frac{1}{|A|} C^T = \frac{1}{24} \begin{bmatrix} -5 & 4 & 7 \\ 4 & -8 & 4 \\ 7 & 4 & -5 \end{bmatrix}$$

[8]

Q.5

$$x + 2y + 3z = 6$$

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

$$3x + 2y + z = 6$$

Write in Matrix form $\Rightarrow$

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 2 \\ 3 & 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ 6 \end{bmatrix}$$
$$\underline{A} \underline{X} = \underline{b}$$

$$\Rightarrow \underline{X} = \underline{A}^{-1} \underline{b}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} -5 & 4 & 7 \\ 4 & -8 & 4 \\ 7 & 4 & -5 \end{bmatrix} \begin{bmatrix} 6 \\ 3 \\ 6 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} -30 + 12 + 42 \\ 24 - 24 + 24 \\ 42 + 12 - 30 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} 24 \\ 24 \\ 24 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

[10 marks]

Q.6 $f(x) = \frac{x+1}{x^2+5x+6}$

$$\Rightarrow \frac{(x+1)}{(x+2)(x+3)} = \frac{A}{(x+2)} + \frac{B}{(x+3)}$$

Multiply through by Denominator $\Rightarrow$

$$x+1 = A(x+3) + B(x+2)$$

Let $x = -2$

$$-2+1 = A(-2+3)$$

$$-1 = A(1)$$

$$\underline{-1 = A}$$

Let $x = -3$

$$-3+1 = B(-3+2)$$

$$-2 = -1B$$

$$2 = B$$

$$\therefore f(x) = \frac{-1}{(x+2)} + \frac{2}{(x+3)}$$