

Q1: [25 MARKS]

$$(i) \cancel{6x} + \cancel{2y} - \cancel{5z} - \cancel{3x} - \cancel{9y} + 3z + \cancel{2x} - \cancel{5y} + \cancel{8z} \quad [5]$$

$$= \underline{5x - 12y + 3z}$$

$$(ii) x(x+3) - x(x-4)$$

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

$$= \underline{3x + 4x} = 7x \quad [5]$$

$$(iii) 2p^2q^1r \times 4p^1q^3 \times 6q^1r^2 \quad [5]$$

$$= \underline{48p^3q^5r^3}$$

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

$$= \frac{3p^2}{q^2r^4}$$

$$(v) \frac{fg}{16h} \times \frac{\cancel{8}gh^2}{\cancel{2}4fh} \times \frac{\cancel{32}fh^3}{\cancel{12}f^3} \quad [5]$$

$$= \frac{1}{3} \frac{f^2g^2h^5}{f^4h^2}$$

$$= \frac{1}{3} \frac{g^2h^3}{f^2}$$

Q2: [20 marks]

(i) $5(x+3) = 2(x-8)$

$$5x + 15 = 2x - 16$$

$$3x = -31$$

$$\underline{x = -3\frac{1}{3}}$$

[8]

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

Mult by 8 $\Rightarrow$

$$2(x-3) = 8x + (3x+4)$$

$$2x - 6 = 8x + 3x + 4$$

$$2x - 6 = 11x + 4$$

$$-10 = 9x$$

$$\underline{\underline{-\frac{10}{9} = x}}$$

[12]

Q.3: [10 marks]

$$2x + 4y = 6 \text{ --- (A) } \times 5$$

$$3x - 5y = -2 \text{ --- (B) } \times 4$$

$$10x + 20y = 30 \text{ --- (C)}$$

$$12x - 20y = -8 \text{ --- (D)}$$

$$\underline{\text{Add}} \quad 22x = 22$$

$$\Rightarrow x = 1$$

Sub $x=1$ into (A)

$$2(1) + 4y = 6$$

$$4y = 4$$

$$y = 1$$

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

[10]

Q.4 [15 marks]

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

$$\begin{aligned} |A| &= +1 \begin{vmatrix} -1 & 2 \\ 2 & 1 \end{vmatrix} - 2 \begin{vmatrix} 2 & 2 \\ 3 & 1 \end{vmatrix} + 3 \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix} \\ &= 1\{-1-4\} - 2\{2-6\} + 3\{4-(-3)\} \\ &= -5 - 2(-4) + 3(7) \\ &= -5 + 8 + 21 \\ &= 24 \end{aligned}$$

Now Co-factor Matrix. - C

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

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

Then Transpose of C is

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

Then $A^{-1} = \frac{1}{|A|} \cdot C^T$

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

Q.5 [10 marks]

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

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

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

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

$$A \underline{x} = \underline{b}$$

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

$$\underline{x} = A^{-1}\underline{b}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{24} \begin{bmatrix} -5 & 4 & 7 \\ 4 & -8 & 4 \\ 7 & 4 & -5 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \\ 2 \end{bmatrix}$$

$$= \frac{1}{24} \begin{bmatrix} -10 + 20 + 14 \\ +8 - 40 + 8 \\ 14 + 20 - 10 \end{bmatrix}$$

$$\Rightarrow \underline{x = 1, \quad y = -1, \quad z = 1}$$

Q.6 [20 MARKS]

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

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

Mult. Thru' by Denominator $\Rightarrow$

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

let $x=1$

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

$$\underline{\frac{3}{4} = A}$$

let $x=-3$

$$-1 = -4B$$

$$\underline{\frac{1}{4} = B}$$

$$\therefore \frac{x+2}{(x-1)(x+3)} = \frac{3/4}{(x-1)} + \frac{1/4}{(x+3)}$$