

DETERMINANT (समांतरिक)

B. Com III (2011)
B.A. (2011)

Q1. Evaluate the following determinant:-

$$\begin{vmatrix} 1 & 2 & 4 \\ 2 & 3 & 7 \\ 3 & 4 & 10 \end{vmatrix}$$

Sol:

प्रथम (column) को हटाए जायेगा, समांतरिक का मान निकालेंगे,

$$\begin{vmatrix} 1 & 2 & 4 \\ 2 & 3 & 7 \\ 3 & 4 & 10 \end{vmatrix} = 1 \begin{vmatrix} 3 & 7 \\ 4 & 10 \end{vmatrix} - 2 \begin{vmatrix} 2 & 4 \\ 4 & 10 \end{vmatrix} + 3 \begin{vmatrix} 2 & 4 \\ 3 & 7 \end{vmatrix}$$

$$\Rightarrow 1(3 \times 10 - 7 \times 4) - 2(2 \times 10 - 4 \times 4) + 3(2 \times 7 - 3 \times 4)$$

$$\Rightarrow 1(30 - 28) - 2(20 - 16) + 3(14 - 12)$$

$$\Rightarrow 1(2) - 2(4) + 3(2)$$

$$\Rightarrow 2 - 8 + 6$$

$$= 0 \text{ Ans.}$$

Q2.

$$\begin{vmatrix} 29 & 26 & 22 \\ 25 & 31 & 27 \\ 63 & 54 & 46 \end{vmatrix}$$

1st method, प्रथम (column) को हटाए जायेगा, समांतरिक का मान निकालेंगे,

$$29 \begin{vmatrix} 31 & 27 \\ 54 & 46 \end{vmatrix} - 25 \begin{vmatrix} 26 & 22 \\ 54 & 46 \end{vmatrix} + 63 \begin{vmatrix} 26 & 22 \\ 31 & 27 \end{vmatrix}$$

$$\Rightarrow 29(31 \times 46 - 27 \times 54) - 25(26 \times 46 - 22 \times 54) + 63(27 \times 26 - 22 \times 31)$$

$$\Rightarrow 29(1426 - 1458) - 25(1196 - 1188) + 63(702 - 682)$$

$$\Rightarrow 29 \times (-32) - 25 \times (8) + 63 \times 20$$

$$\Rightarrow -928 - 200 + 1260 \Rightarrow -1128 + 1260 = 132 \text{ Ans}$$

2nd method

1st, 2nd, & 3rd column में से 1st column को हटाए जायेगा, समांतरिक का मान निकालेंगे,

$$\Delta = \begin{vmatrix} 29 & 26 & 22 \\ 25 & 31 & 27 \\ 63 & 54 & 46 \end{vmatrix} = \begin{vmatrix} 29 & (26-29) & (22-29) \\ 25 & (31-25) & (27-25) \\ 63 & (54-63) & (46-63) \end{vmatrix}$$

$$\Delta = \begin{vmatrix} 29 & -3 & -7 \\ 25 & +6 & +2 \\ 63 & +9 & -17 \end{vmatrix}$$

$$= 29 \begin{vmatrix} +6 & +2 \\ -9 & -17 \end{vmatrix} - 25 \begin{vmatrix} -3 & -7 \\ -9 & -17 \end{vmatrix} + 63 \begin{vmatrix} -3 & -7 \\ +6 & +2 \end{vmatrix}$$

$$= 29 \{ (6 \times -17) - (2 \times -9) \} - 25 \{ (-17 \times -3) - (-7 \times -9) \} + 63 \{ (2 \times -3) - (6 \times -7) \}$$

$$= 29 \{ -102 - (-18) \} - 25 \{ 51 - 63 \} + 63 \{ -6 - (-42) \}$$

$$= 29(-102 + 18) - 25(-12) + 63(-6 + 42)$$

$$= 29 \times (-84) - 25 \times (-12) + 63(36)$$

$$= -2436 + 300 + 2268$$

$$= -2436 + 2568$$

$$= 132 \text{ Ans.}$$

Q3.

$$\Delta = \begin{vmatrix} 24 & 30 & 3 \\ 56 & 70 & 17 \\ 73 & 90 & 22 \end{vmatrix}$$

Solⁿ

$$= \begin{vmatrix} 24 & 30 & 3 \\ 56 & 70 & 17 \\ 73 & 90 & 22 \end{vmatrix} = \begin{vmatrix} 24 & 3 \times 10 & 3 \\ 56 & 7 \times 10 & 17 \\ 73 & 9 \times 10 & 22 \end{vmatrix} = 10 \begin{vmatrix} 24 & 3 & 3 \\ 56 & 7 & 17 \\ 73 & 9 & 22 \end{vmatrix}$$

$$= 10 \times \left[24 \begin{vmatrix} 7 & 17 \\ 9 & 22 \end{vmatrix} - 56 \begin{vmatrix} 3 & 3 \\ 9 & 22 \end{vmatrix} + 73 \begin{vmatrix} 3 & 3 \\ 7 & 17 \end{vmatrix} \right]$$

$$= 10 \times \left[24(7 \times 22 - 17 \times 9) \right] - 56 \left[3 \times 22 - 3 \times 9 \right] + 73 \left[17 \times 3 - 3 \times 7 \right]$$

$$= 10 \times \left[24(154 - 153) - 56(66 - 27) + 73(51 - 21) \right]$$

$$= 10 \times \left[24 \times 1 - 56 \times 39 + 73 \times 30 \right] \Rightarrow 10 \left[24 - 2184 + 2190 \right]$$

$$\Rightarrow 10 \times 30 = 300 \text{ Ans.}$$

Q4. $\Delta = \begin{vmatrix} 1 & 4 & -2 \\ 3 & 1 & 5 \\ 2 & 3 & 1 \end{vmatrix}$

Solⁿ $\Delta = 1 \begin{vmatrix} 1 & 5 \\ 3 & 1 \end{vmatrix} - 3 \begin{vmatrix} 4 & -2 \\ 3 & 1 \end{vmatrix} + 2 \begin{vmatrix} 4 & -2 \\ 1 & 5 \end{vmatrix}$
 $= 1(1 \times 1 - 3 \times 5) - 3[(4 \times 1 - (-2 \times 3))] + 2(5 \times 4 - (-2 \times 1))$
 $= 1(1 - 15) - 3(4 + 6) + 2(20 + 2)$
 $= -14 - 30 + 44 = 0$ Ans.

Q5. $\begin{vmatrix} 3 & 4 & -2 \\ 7 & 1 & 5 \\ 5 & 3 & 1 \end{vmatrix}$

Solⁿ $\begin{vmatrix} 3 & 4 & -2 \\ 7 & 1 & 5 \\ 5 & 3 & 1 \end{vmatrix} = 3 \begin{vmatrix} 1 & 5 \\ 3 & 1 \end{vmatrix} - 7 \begin{vmatrix} 4 & -2 \\ 3 & 1 \end{vmatrix} + 5 \begin{vmatrix} 4 & -2 \\ 1 & 5 \end{vmatrix}$
 $\Delta = 3(1 - 15) - 7(4 + 6) + 5(20 + 2)$
 $= 3 \times -14 - 7 \times 10 + 5 \times 22$
 $= -42 - 70 + ~~102~~ 112$
 $= 112 - 112 = 0$ Ans.

Q6. $\begin{vmatrix} 1 & 3 & -2 \\ 3 & 7 & 15 \\ 2 & 5 & 1 \end{vmatrix}$

$\Delta = 1 \begin{vmatrix} 7 & 15 \\ 5 & 1 \end{vmatrix} - 3 \begin{vmatrix} 3 & -2 \\ 5 & 1 \end{vmatrix} + 2 \begin{vmatrix} 3 & -2 \\ 7 & 15 \end{vmatrix}$
 $\Delta = 1(7 \times 1 - 5 \times 15) - 3(1 \times 3 - (-2 \times 5)) + 2(3 \times 15 - 7 \times -2)$
 $\Delta = (7 + 25) - 3(3 + 10) + 2(+15 + 14)$
 $= -18 ~~18~~ - 3 \times 13 + 2 \times 29 \Rightarrow -18 - 39 + 58$
 $= 32 - 40 \Rightarrow -8$ Ans.

Q7.
$$\begin{vmatrix} 19 & 17 & 15 \\ 9 & 8 & 7 \\ 1 & 1 & 1 \end{vmatrix}$$

$$\Rightarrow \begin{vmatrix} 19 & -2 & -4 \\ 9 & -1 & -2 \\ 1 & 0 & 0 \end{vmatrix} \Rightarrow \Delta = 19 \begin{vmatrix} -1 & -2 \\ 0 & 0 \end{vmatrix} - 9 \begin{vmatrix} -2 & -4 \\ 0 & 0 \end{vmatrix} + 1 \begin{vmatrix} -2 & -4 \\ -1 & -2 \end{vmatrix}$$

$$\Rightarrow \Delta = 19 \times 0 - 9 \times 0 + 1[-2 \times -2 - (-4 \times -1)]$$

$$\Rightarrow \Delta = 1(4 - 4) = 1 \times 0 = 0 \text{ Ans.}$$

Q

End of exercise. 5(A).