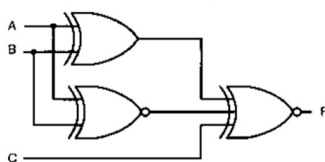**IIITB COMET**
F O U N D A T I O N

Q.12

Question: For the output **F** to be 1 in the logic circuit shown, the input combination should be:

Options:

(A) A = 1, B = 1, C = 0   (C) A = 0, B = 1, C = 0
(B) A = 1, B = 0, C = 0   (D) A = 0, B = 0, C = 1

Detailed Solution

We analyze the circuit step by step:

$$X = A \oplus B \quad \text{(XOR gate output)}$$
$$Y = (A \oplus B)' \quad \text{(XNOR gate output)}$$
$$Z = X + Y \quad \text{(OR gate output)}$$
$$F = Z \oplus C \quad \text{(Final XOR with input C)}$$

Option (A): A = 1, B = 1, C = 0

$$X = 1 \oplus 1 = 0$$
$$Y = (1 \oplus 1)' = 1$$
$$Z = 0 + 1 = 1$$
$$F = 1 \oplus 0 = 1 \quad \checkmark$$

Option (B): A = 1, B = 0, C = 0

$$X = 1 \oplus 0 = 1$$
$$Y = (1 \oplus 0)' = 0$$
$$Z = 1 + 0 = 1$$
$$F = 1 \oplus 0 = 1 \quad \checkmark$$

Option (C): A = 0, B = 1, C = 0

$$X = 0 \oplus 1 = 1$$
$$Y = (0 \oplus 1)' = 0$$
$$Z = 1 + 0 = 1$$
$$F = 1 \oplus 0 = 1 \quad \checkmark$$

Option (D): A = 0, B = 0, C = 1

$$X = 0 \oplus 0 = 0$$
$$Y = (0 \oplus 0)' = 1$$
$$Z = 0 + 1 = 1$$
$$F = 1 \oplus 1 = 0 \quad \times$$

Conclusion

Options (A), (B), and (C) all result in $F = 1$.

Correct Answers: (A), (B), and (C)