

RAN-2311000901040001
F.Y.B.C.A. (Sem. - I) Examination November - 2025
MDC - 102 : Mathematics
[Total Marks: 50
સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book.
- (2) All questions are compulsory.
- (3) Figures to the right indicate marks of the corresponding question.

Seat No.:

Student's Signature

Q. 1. Answer the following.
(10)

- (1) If $A = \{1, 2, 3, 4\}$ and $B = \{2, 3, 4\}$ then $n(A \times B) = \underline{\hspace{2cm}}$
- (2) If $f(x) = 2x^2$ then $f(-1) - f(2) + f(1) = \underline{\hspace{2cm}}$
- (3) If $A = \begin{bmatrix} 4 & 7 \\ -1 & 3 \end{bmatrix}$ then $\det(A) = \underline{\hspace{2cm}}$
- (4) Define Composite statement, give an illustration.
- (5) State associative property for ' $\bullet$ ' in Boolean algebra, give an illustration.

Q. 2. Answer the following. (Any Two)
(10)

- (1) In usual notation prove that $A - (B \cap C) = (A - B) \cup (A - C)$
- (2) If $A = \{x: x \in \mathbb{N}, x < 6\}$, $B = \{x: x \in \mathbb{N}, 3 < x < 9\}$ and $C = \{1, 4, 5, 7\}$ the verify $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$
- (3) Verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$ for $A = \{2, 3, 5\}$; $B = \{3, 7\}$; $C = \{3, 8\}$.

Q. 3. Answer the following. (Any Two)
(10)

- (1) If the demand function is $d = f(p) = 4000 - 2p^2$ then find the demand when $p = 22$ and find p when $d = 6$.
- (2) If $f(x) = \frac{1}{x+1}$, $x \in \mathbb{Z} - \{-1, 1\}$ then prove that $f(-x) - f(x) = \frac{2}{1-x^2}$
- (3) If $f(x) = 2x^2 - 1$ and $g(x) = 2x - 1$; where $D_f = D_g = \{0, 1, 2\}$. Is $f = g$? Justify your answer.

Q. 4. Answer the following. (Any Two)
(10)

- (1) Using truth-table prove that the argument is logically valid:
Hypothesis: $S_1: p \wedge q, S_2: \sim p$.
Conclusion: $S: q$
- (2) Construct the input / output table for
 - (i) $f(x_1, x_2) = (x_1 \bullet x_2)' + x_2$
 - (ii) $f(x_1, x_2, x_3) = (x_1 \bullet x_2') \bullet x_3$

(3) Show that D_6 is a Boolean Algebra; $\forall a, b \in D_6$

$a + b = \text{L.C.M. of } a, b$

$a \cdot b = \text{G.C.D. of } a, b \text{ and } a' = \frac{6}{a}$

Q. 5. Answer the following. (Any Two)

(10)

(1) If $A = \begin{bmatrix} 4 & -2 & 9 \\ 0 & -2 & -1 \\ 2 & 3 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & -4 \\ 1 & 3 & -2 \\ 1 & 3 & -2 \end{bmatrix}$ then show that $(AB)^T = B^T A^T$

(2) Find inverse of the matrix $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & -1 \\ 1 & 1 & 2 \end{bmatrix}$

(3) Solve the following equations using Cramer's rule:

$$x + 2y + 3z = 14,$$

$$2x + y + z = 7,$$

$$5x + 2y + z = 12$$
