

1811000101020001
EXAMINATION MARCH 2024
BACHELOR OF COMPUTER APPLICATIONS
(FIRST SEMESTER)
MATHEMATICS

[Time: Three Hours]

[Max. Marks: 70]

Instructions:

1. Fill up strictly the following details on your answer book

- a. Name of the Examination : **BACHELOR OF COMPUTER APPLICATIONS (FIRST SEMESTER)**
 - b. Name of the Subject : **MATHEMATICS**
 - c. Subject Code No : **1811000101020001**
2. Sketch neat and labelled diagram wherever necessary.
 3. Figures to the right indicate full marks of the question.
 4. All questions are compulsory.
 5. Follow usual notations.
 6. Use of non-programmable scientific calculator is allowed.

Seat No:

--	--	--	--	--	--

Student's Signature

Q.1 Answer the following:

10

- 1] Define equivalent sets.
- 2] Explain the symmetric difference of two sets using illustration.
- 3] Define Bijection with illustration.
- 4] If $f(x) = x^2 + 2x - 3$ and $D_f = \{-3, -2, 1, 3\}$ then find R_f .
- 5] If $A = \{a, b, c\}$ then write the power set of A
- 6] Evaluate: $\begin{vmatrix} 3 & -3 \\ 2 & 4 \end{vmatrix}$
- 7] Define Boolean algebra.
- 8] Write the dual statement of $x \cdot (y + z) = (x \cdot y) + (x \cdot z)$
- 9] Prove that $p \vee t = t$ where p is the statement and t means tautology.
- 10] Define symmetric matrix.

Q.2 (a) In usual notations prove that $(A \cap B)' = A' \cup B'$ **5**

OR

(a) In usual notations prove that $A - (B \cup C) = (A - B) \cap (A - C)$

(b) Attempt any two: **10**

1] In a society of 250 people, each person speaks either Gujarati or Hindi, 158 people speak Gujarati and 185 speak Hindi then find

- (i) The number of people who can speak both the languages.
- (ii) The number of people who speak only Gujarati.

2] If $A = \{x|x \in \mathbb{N}; 3 < x < 7\}$, $B = \{x|x \in \mathbb{N}; x^2 < 6x\}$ and $U = \{x|x \in \mathbb{N}; x < 10\}$ then prove that $(A \cap B)' = A' \cup B'$

3] If $A = \{a, b, c\}$, $B = \{b, c, d, e\}$ and $C = \{b, d, f, h\}$ then verify

- (i) $A \cup B = (A - B) \cup B$
- (ii) $A \cap (B - C) = (A \cap B) - (A \cap C)$

Q.3 (a) If $f(x) = x(x + 1)(2x + 1)$ then prove that $f(x) - f(x + 1) = 6x^2$. **5**

OR

(a) If $f(x) = x^2 + x - 1$ then find the value of $f(x - 1) - 2f(x + 1)$

(b) Attempt any two: **10**

1] If $f(x) = \frac{x^2 - x}{x + 3}$ then find $\frac{f(1) + f(0)}{f(-1) + f(2)}$

2] If $f(x) = x^2 + 4x + 5$ and $g(x) = 2x + 1$ then find $f(1) + 3g(2)$

3] The cost function of an item is $C(x) = 4x + 770$ and the selling price per unit is Rs. 15. Then find the Break Even point. If the profit is Rs. 1100 then find the number of units to be produced.

Q.4

(a) If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then prove that $A^2 - 4A - 5I = 0$.

5

OR

(a) Solve the following equations by Cramer's Rule:

$$x + 2y + 3z - 14 = 0, 2x + y + z - 7 = 0, 5x + 2y + z - 12 = 0$$

(b) **Attempt any two:**

10

1] If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ then prove that $A^2 = I$.

2] Solve the following equations by Cramer's Rule:

$$2x + 8y = 3xy, 4x + 12y = 5xy$$

3] Evaluate: $\begin{vmatrix} x+1 & 2 & 3 \\ 1 & x+2 & 3 \\ 1 & 2 & x+3 \end{vmatrix}$

Q.5

(a) Using truth tables prove that $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.

5

OR

(a) Is $\sim (p \vee q) \wedge (\sim p \vee q) \wedge p$ is a tautology?

(b) **Attempt any two:**

10

1] Let $B = \{0, 1\}$. Prepare an input/output table for the boolean function

$$f : B^2 \rightarrow B, f(x_1, x_2) = x_1 \cdot x_2'$$

2] Check the validity of the following argument:

$$\text{Hypothesis } S_1: p \wedge (\sim q) \Rightarrow r, S_2: p \vee q, S_3: q \Rightarrow p$$

$$\text{Conclusion: } S: r$$

3] Is $(D_{12}, +, \cdot, ', 1, 12)$ a Boolean Algebra?

$$\forall x, y \in D_{12}, x + y = \text{LCM of } x, y, \quad x \cdot y = \text{GCD of } x, y \text{ and } x' = 12/x$$
