Bachelor of Computer Application (BCA)

1st Sem. (Batch 2023-26) (CBGS)

APPLIED & DISCRETE MATHEMATICS

Paper—III

Time Allowed—3 Hours] [Maximum Marks—75

Note :— Attempt **FIVE** questions in all, selecting at least **ONE** question from each section. The fifth question may be attempted from any section. All questions carry equal marks.

SECTION—A

1 (i) (a) If A = [1, 3, 5, 7, 9], B = [2, 4, 6, 8, 10], C = [1, 2, 3, 4] Show that $A \cap (B - C) \neq A - (B \cap C)$.

(b) A = [1, 2, 3, 4, 5], B = [1, 3, 5, 7, 9], C = [2, 4, 8, 10] Verify that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. 3+3

(ii) In a town with a population of 3000, 2200 persons read the Tribune, 1000 read the Indian Express and 300 read both. Find how many read neither. 5

(iii) If $A = [1, 4, 6, 5]$, $B = [5, 9, 11]$ verify that $A \cap (B - A) = \phi$. 4

2. (i) Let $A = \left[\frac{1}{2}, 2\right]$, $B = [2, 3, 5]$, $C = [-1, -2]$. Verify that $A \times (B \cup C) = (A \times B) \cap (A \times C)$. 7

(ii) Define (a) set (b) relation, each with example. 2

(iii) Let $A = [1, 2, 3]$, $B = [2, 3, 4]$, $C = [4, 5]$. Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$. 6

SECTION—B

3. (i) Check whether the following statement is tautology $[(p \to q) \wedge (q \to r)] \to (p \to r)$. 7

(ii) Over the universe of books. Define the proposition

B(x): x has a blue cover

M(x): x is a Mathematics book

U(x): x is published in United States. Translate the following :

(a) $(\exists x)\,(M(x) \wedge \sim B(x))$

(b) $(\forall x)\,(M(x) \wedge U(x) \to B(x))$

(c) $(\exists x)\,(\sim B(x))$ 8

4. (i) Distinguish quantifier and predicates. 4

(ii) Give an example of tautology, contradiction, contingency with the help of truth table. 3

(iii) Determine the validity of following argument with the help of truth table :

(a) If a man is bachelor, then he is unhappy

(b) If a man is unhappy then he dies young

(c) Therefore, bachelor die young. 8

SECTION—C

5. (i) State and explain representation theorem. 10

(ii) Minimize : $Y(A, B, C, D) = \Sigma m(1, 3, 7, 11, 15) + \Sigma(0, 2, 5)$. 5

(i) Convert the following boolean expression into DN form : $[(xy^c)^c + z^c].(x^c + z)^c$. 7

(ii) Discuss various types of grouping existing in K-map of two variables and verify result. 8

SECTION—D

7 (i) If $A=\begin{vmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{vmatrix}=$, find $A^3 - 6A^2 + 7A + 2I$. 7.5

(ii) Find inverse of given matrix :

$$A = \begin{vmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{vmatrix}.$$ 7.5

8. (i) Express the following matrix into sum of symmetric and skew symmetric matrix :

$$A = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}.$$ 7.5

(ii) Solve the following linear equations by matrix inversion method :

$3x + y + 2z = 3$

$2x - 3y - z = -3$

$x + 2y + z = 4$ 7.5