Exam. Code : 105701
Subject Code : 1444

B.Sc. Information Technology 1ˢᵗ Semester

APPLIED & DISCRETE MATHEMATICS

Paper—III

Time Allowed—Three Hours]   [Maximum Marks—75

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

SECTION—A

1. (a) If $A = [4, 5, 8, 12]$, $B = [1, 4, 6, 9]$, $C = [1, 2, 3, 4]$ find $A – (B – A)$ and $A – (C – B)$.

    (b) $A = [2, 3, 4, 5, 6]$, $B = [3, 5, 7, 9]$, $C = [1, 2, 3, 4]$ show $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

                                                          7.5+7.5=15

2. (a) In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of students knows either Hindi or English. How many students are there in a group ?

(b) Let $A = \left[\dfrac{1}{2}, 2\right]$, B = [2, 3, 5], C = [−1, −2] verify

that $A \times (B - C) = (A \times B) - (A \times C)$.

7.5+7.5 = 15

SECTION—B

3. (a) Using truth table prove that :

$p \vee (q \wedge r) \cong (p \vee q) \wedge (p \vee r)$.

(b) Test the validity of following argument using truth table. If it rain then crop will be good. It did not rain, therefore crop will not be good.

7.5+7.5=15

4. (a) Define :
   (i) Conditional connector
   (ii) Bi conditional connector
   (iii) NAND connector
   (iv) NOR connector
   (v) XOR connector.

(b) Prove that :

$(p \leftrightarrow q) \leftrightarrow r \cong p \leftrightarrow (q \leftrightarrow r)$

7.5+7.5=15

SECTION—C

5. (a) Show that set of all positive divisor of 12 does not form Boolean algebra under divisibility.

(b) Simplify Boolean expression :

$xyz + x'z' + xyz' + x'y'z + x'yz'$

7.5+7.5=15

6. (a) Minimize the function :

$$p(A, B, C) = \Sigma m(0, 3, 5, 6, 7) + d(2, 4)$$

(b) Prove that :

$$(A + B)(\overline{A} + C) = AC + \overline{A}B \qquad 7.5+7.5=15$$

SECTION—D

7. (a) Find rank $A = \begin{bmatrix} 3 & 4 & 12 \\ 9 & 12 & 15 \\ -6 & -8 & -10 \end{bmatrix}$.

(b) Find inverse of matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$.

$$7.5+7.5=15$$

8. (a) If $A = \begin{bmatrix} 1 & 1 & -1 \\ 3 & 0 & 3 \\ 4 & 5 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

verify that $(AB)' = B'A'$.

(b) Let $f(x) = x^2 - 5x + 6$ find $f(A)$ if

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}. \qquad 7.5+7.5=15$$