Exam. Code : 107201
Subject Code : 1746

Bachelor of Computer Application (BCA) 1st Semester

APPLIED AND DISCRETE MATHEMATICS

Paper—III

Time Allowed—3 Hours] [Maximum Marks—75

Note :— Attempt any **five** questions by selecting at least **one** from each Section. The fifth question may be attempted from any Section.

SECTION—A

1. a) Let A = [1, 2, 3, 4, 5, 6] and B = [2, 4, 6, 8]; show that A – B ≠ B – A.

   b) A = [1, 2, 3, 4, 5], B = [1, 3, 5, 7, 9] and C = [2, 4, 8, 10];

   verify A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C).

   c) In a class of 25 students, 12 have taken Economics, 8 have taken Economics but not History. Find the number of students who have taken Economics and History and those who have taken History but not Economics. 5+5+5

2. (a) Let A = [1, 2, 3] B = [2, 3, 4] C = [4, 5]; verify A × (B ∩ C) = (A × B) ∩ (A × C).

   (b) Define :

   (i) Reflexive relation

   (ii) Symmetric relation

   (iii) Transitive relation

   (iv) Anti-symmetric relation

   (v) Intersection of two sets. 7.5+7.5

SECTION—B

3. (a) Prove the validity of following arguments with truth table 'if man is bachelor, he is unhappy', 'if man is unhappy, he dies young'. Therefore bachelor die young.

   (b) Prove that $(p \rightarrow q) \wedge (q \rightarrow r) \Rightarrow (p \rightarrow q)$ is tautology. 7.5+7.5

4. (a) Show that $[p \vee (q \wedge r)] \equiv (p \vee q) \wedge (p \vee r)$ are logically equivalent using truth table.

   (b) Define :

   (i) Conjunction connector

   (ii) Disjunction connector

   (iii) XOR connector

   (iv) Conditional connector

   (v) Bi-conditional connector, with help of truth table. 7.5+7.5

SECTION—C

5. (a) $[(xy)'z]'.[(x'+z)(y'+z')']$. Reduce to DN form.

(b) Show that xz' is prime implicant of

$xy' + xyz' + x'yz'$. 7.5+7.5

6. (a) Show that $(A + B)(\bar{A} + C) = AC + \bar{A}B$.

(b) $f(A, B, C) = \sum m(0, 3, 5, 6, 7) + d(2, 4)$.

(c) Define Fundamental product with example. 5+5+5

SECTION—D

7. (a) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ Show $A^3 - 6A^2 + 7A + 2I = 0$.

(b) Find inverse of matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$. 7.5+7.5

8. (a) Find rank of matrix $A = \begin{bmatrix} 4 & 2 & 3 \\ 8 & 5 & 2 \\ 12 & -4 & 5 \end{bmatrix}$.

(b) Express the given matrix as sum of symmetric and

Skew-Symmetric matrix $A = \begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}$.

7.5+7.5