(b) Explain the following :

   (i) Cyclic group

   (ii) Permutation group

   (iii) Homomorphism

   (iv) Isomorphism of group.

Unit III

6. (a) The sum of three numbers in AP is 15. If 1, 4 and 19 are added to the numbers, the resulting numbers are in G.P. Find the numbers.

  (b) Resolve into partial fractions :

$$\frac{1}{(x+2)(x-3)}.$$

  (c) Solve the recurrence relation :

$$a_n - 4a_{n-1} + 4a_{n-2} = 0.$$

7. (a) Solve the recurrence relation :

$$a_{n+2} - a_{n+1} - 2a_n = n^2.$$

Subject Code—7304

B. Tech. (CSE/IT) EXAMINATION

(Batch 2018 Onwards)

(Third Semester)

MATHEMATICS

IT203T/CSE203T

Discrete Mathematics

Time : 3 Hours   *Maximum Marks :* 70

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) Define Multiset and Equal set along with *one* example for each.

  (b) What do you mean by Into function and Onto function ?

(c) Construct table for : $p \rightarrow q$ and $\sim p \vee q$.

(d) Define a semi-group.

(e) The pth term of an AP is q and the qth term is p. Find the $(p+q)^{th}$ term.

(f) Define Bipartiteg graphs.

(g) What do you mean by Hamiltonian graphs ?

Unit I

2. (a) Prove that :

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

using Venn diagram.

(b) If :

$$A = \{2, 3\}, B = \{6, 8\}, C = \{1, 2\},$$
$$D = \{6, 9\}$$

check whether

$$(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D).$$

(c) In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket ?

3. (a) Explain Inverse relation, Identity relation, Universal relation and Void relation in a set along with *one* example for each.

(b) Define Partial order relation. For all $a, b \in N$, $a \mid b \Leftrightarrow b = ka$ for some integer K. Prove that / (divides) is a partial relation on N. Also define recursively defined function along with *one* example.

Unit II

4. (a) Explain Conditional and Biconditional statements. Construct truth table for :

$$p \vee \sim q \rightarrow \sim p, \sim (\sim p \vee q).$$

(b) What do you mean by logical equivalence ? Prove by truth table that the following are logically equivalent :

$$p \leftrightarrow q \text{ and } (p \rightarrow q) \wedge (q \rightarrow p);$$
$$\sim (p \leftrightarrow q) \text{ and } (p \wedge \sim q) \vee (\sim p \wedge q)$$

5. (a) Define a Normal Subgroup. Prove that for any two subgroup H and K of a group G, if H is normal in G, then H∩K is normal in K.

8. (a) Define the following :

(i) Degree of Vertex

(ii) Regular Graph

(iii) Connectivity

(iv) Bridges.

(b) Explain the following along with example for each :

(i) Trees

(ii) Spanning Trees

(iii) Euler Graph.

9. (a) Explain Kruskal's algorithm for minimal spanning trees. Show how Kruskal's algorithm to find a minimal spanning tree for the graph.
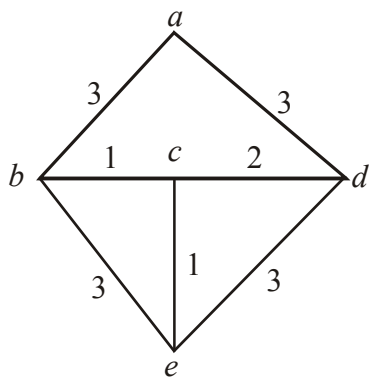
(b) Explain an algorithm to find shortest path.

(b) Use generating functions to solve the recurrence relation :

$$a_n - 9a_{n-1} + 20a_{n-2} = 0,$$

$$a_0 = -3, a_1 = -10.$$

Unit IV