

## DISCRETE MATHEMATICS-I

### Paper - II Semester-V

Time Allowed : 3 Hours]

[Maximum Marks : 40

Note : The candidates are required to attempt *five* questions in all, selecting *two* questions each from Section A and B of the questions paper and the entire Section-C. All questions will carry equal marks.

#### Section - A

1. (a) Prove that a set containing 15 distinct elements has  $2^{15}$  subset.  
(b) In a Class of 60 boys, there are 45 boys who play cards and 30 boys carom. How many boys play both games ? How many play cards only and how many play carom ?
2. (a) Prove by the Mathematical induction that  $5^{2n+2} - 24n - 25$  is divisible by 576.  
(b) Explain type of Grammars and Languages.
3. (a) Use Binomial theorem to find value of  $19^5$ .  
(b) Find the number of permutations of the letters of the word 'COMMERCE'.
4. (a) Define circular permutations. In how many ways can 6 beads of different colours from a necklace ?  
(b) A man has four friends. In how many ways can he invite one or more friends to a Tea party ?

#### Section - B

5. (a) Prove that the following statements are equivalence for a graph G :  
(i) G is a 2-colorable  
(ii) G is bipartite  
(iii) G contains no. odd cycle.  
(b) Can a graph with seven vertices be isomorphic to its complement ? Justify.
6. State and prove five Colour theorem.
7. (a) A simple undirected graph G is a tree if and only if G is connected and has no cycles.  
(b) Modify Kruskal's algorithm so that it will produce a maximal spanning tree, that is one with largest possible sum of weights.
8. Explain the Finite state Machines as language recognizers with example.

#### Section - C

9. (a) Define the term root and leaf in a tree. 1  
(b) Show that a linear planar graph with less than 30 edges has a vertex of degree 4 or less. 1  
(c) State Euler's formula. 1  
(d) State basic Counting principles. 1  
(e) Define Partial order relations with example. 1  
(f) State Four colour theorem. 1  
(g) Draw a binary tree representing the expression  $((x + y) \uparrow 2) + ((x - 4)/3)$ . ½

- (h) State three forms of the Pigeonhole principle.  
(i) Find out the cardinality of the set  $Q$  of rational.  
(j) Define Symmetric difference of two sets.
- 

$\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$