

**301401****May 2019****B.Tech. (CE/IT/CSE)- IVth Semester****DISCRETE MATHEMATICS****(PCC-CS-401)****Time : 3 Hours]****[Max. Marks : 75***Instructions :*

- (i) *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
- (ii) *Answer any four questions from Part-B in detail.*
- (iii) *Different sub-parts of a question are to be attempted adjacent to each other.*

**PART-A**

1. (a) For any set A and B, show that

$$(A \cap B) \cup (A - B) = A. \quad (1.5)$$

- (b) Define equivalence relation with example. (1.5)

- (c) How many 11 letter words can be formed using letters from the word "INSTITUTION" ? (1.5)

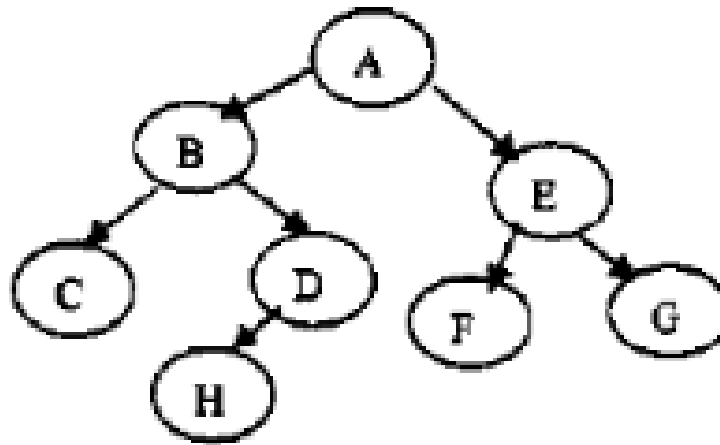
- (d) Show that  $1^2 + 2^2 + 3^2 + \dots + n^2 = n(n+1)(2n+1)/6$ . (1.5)

- (e) What is a bipartite Graph? (1.5)
- (f) Define Euler Formula. (1.5)
- (g) What is a cut point and bridge in graphs ? (1.5)
- (h) What are quantifiers in propositions? (1.5)
- (i) What are bijective functions? (1.5)
- (j) List the applications of trees. (1.5)

### PART-B

2. (a) Let  $f$  be a function from the set of integers such that  $f(x) = x + 1$ . Is  $f$  invertible, and if it is what is its inverse? (5)
- (b) Seven women and nine men are on faculty in the mathematics department in a university. In how many ways a committee of five members of the department can be constructed if at least one woman and atleast one man must be in the committee?
- (c) Define Cantor's Diagonal Argument. (5)
3. (a) Show that following implication is tautology :
  - (i)  $(p \Rightarrow q) \vee r \Leftrightarrow [(p \vee r) \Rightarrow (q \vee r)] \Rightarrow$
  - (ii)  $(p \wedge q \Rightarrow r) \Leftrightarrow (p \Rightarrow r) \vee (q \Rightarrow r)$  (10)
- (b) Find the validity of the following Argument :  
 Either Ram is a good boy or Rahul is a good boy.  
 Ram is not a good boy therefore Rahul is a good boy. (5)

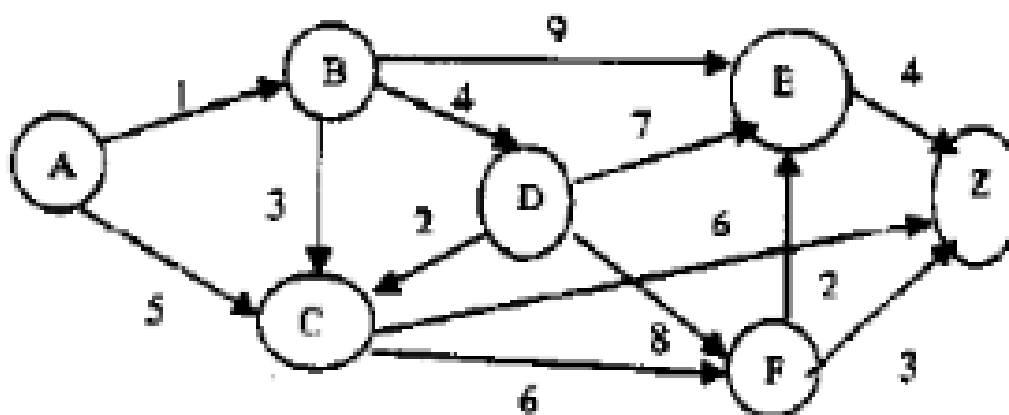
4. (a) Determine the Inorder, preorder and postorder Traversal of following tree : (6)



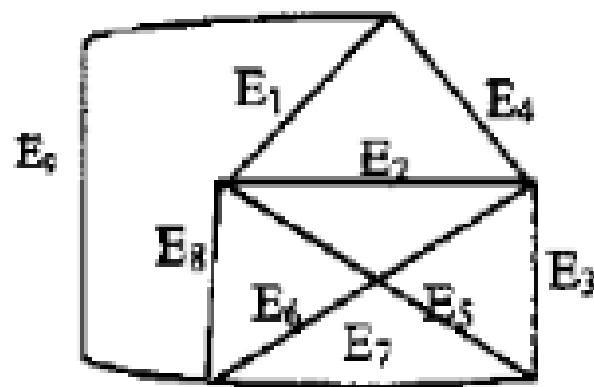
- (b) Write short notes on following :

- (i) CNF.
- (ii) Hamiltonian Graph.
- (iii) Subgroups in algebraic structures. (9)

5. (a) Find the shortest distance between A and Z : (10)



- (b) What is a chromatic number in a graph?. Determine the chromatic number for the following graph : (5)



6. (a) Explain and prove Schroeder Bernstein theorem. (10)
- (b) What is a Perfect Graph? Explain with example. (5)
7. (a) What is Integral domain? Explain with example. (5)
- (b) Consider an algebraic system  $(Q, *)$  where  $Q$  is a set of rational numbers and  $*$  is binary operation defined by:

$$a * b = a + b - ab$$

Determine whether  $(Q, *)$  is a group. (10)

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