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## B.Tech. Degree III Semester Examination November 2017

### CS/IT 15-1303 DISCRETE COMPUTATIONAL STRUCTURES (2015 Scheme)

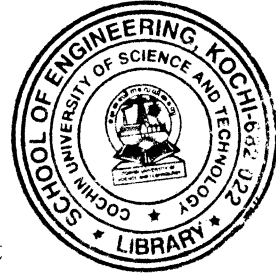
Time : 3 Hours

Maximum Marks : 60

#### PART A (Answer *ALL* questions)

(10 × 2 = 20)

- I. (a) Define tautology, contradiction and contingency with example.
- (b) Prove that  $p \leftrightarrow q \equiv (p \wedge q) \vee (\sim p \wedge \sim q)$ .
- (c) How many of the numbers will have the same remainder when divided by 7 if any eight positive integers are chosen?
- (d) Solve  $a_r - 4a_{r-1} + 4a_{r-2} = 0$  with  $a_0 = 1$  and  $a_1 = 6$ .
- (e) Give an example of a graph that has an Euler circuit which is also Hamiltonian.
- (f) Define complete binary tree. What is the depth of complete binary tree if 'n' nodes are there in the tree?
- (g) Define abelian group. Show that an algebraic system  $(G, *)$  where G is the set of all non-zero reals and \* is a binary operation defined by  $a*b = (ab)/4$  is abelian.
- (h) Define bounded lattice and complemented lattices.
- (i) Determine whether the relation  $S = \{(a, b) : a \geq b\}$  on set R of real numbers is an equivalence relation.
- (j) Consider the functions f, g, h on integers defined by  $f(n) = n^2$ ,  $g(n) = n+1$ ,  $h(n) = n-1$ . Find hofog and fogoh.



#### PART B

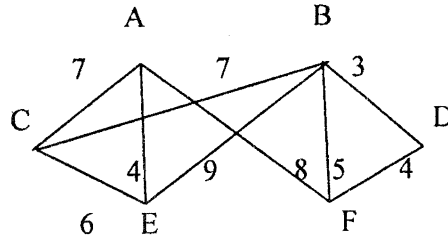
(4 × 10 = 40)

- II. (a) Prove by induction (i)  $11^{n+2} + 12^{2n+1}$  is divisible by 133.
- (b) Sum of cubes of three consecutive integers is divisible by 9.
- OR**
- III. (a) Among the first 500 positive integers how many are not divisible by 2 nor 3 nor 5. Also determine the number of integers that are exactly divisible by one of them.
- (b) If R & S are equivalence relations prove  $R \cap S$  and  $R \cup S$  are equivalence relations.
- IV. (a) Solve  $a_r + a_{r-1} + a_{r-2} = 0$  with initial condition  $a_0 = 1$  and  $a_1 = 1$ .
- (b) If 9 colors are used to paint 100 houses how many houses will have the same color.

OR

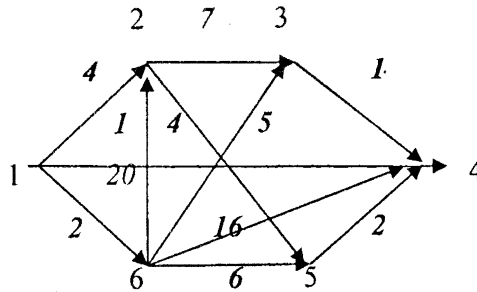
(P.T.O.)

- V. (a) What are the characteristics of algorithm?  
 (b) Define Best case time, worst case time, average case time,  $\theta$  notation, O notation.
- VI. (a) Given the inorder and preorder of binary tree.  
 Inorder:  $3 * a + b * b * c + d$   
 Preorder:  $* * * 3 a b + * b c d$ . Draw the tree.  
 (b) Find the minimum spanning tree by Kruskal's algorithm.



OR

- VII. (a) Give example for a graph which is neither Euler circuit nor Hamiltonian circuit.  
 (b) Find the shortest path from vertex 1 to vertex 4 using Dijkstra's algorithm



- VIII. (a) Define Poset and Lattice.  
 (b) Determine all sub lattices of  $D_{30}$  that contain at least four elements.

OR

- IX. (a) Define field and ring.  
 (b) Let  $S$  is  $\{0, 1, 2, 3, 4\}$  and addition modulo 5 and multiplication modulo 5, Check whether  $(S, +, *)$  form a field.

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