KJ-425

M.Sc. (Computer Science)

1st Semester Examination, June, 2020

Paper - I

Mathematical Foundation of Computer Science

Time : Three Hours] [*Maximum Marks* : 100

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (*a*) Find the number of integers between 1 and 250 that are divisible by 2, 3, 5 and 7.

(*b*) Prove that following statement is contradiction :

$[(p \wedge r) \vee (q \wedge \sim r)] \Leftrightarrow [(\sim p \wedge r) \vee (\sim q \wedge \sim r)]$

(*c*) If R is an equivalance relation in the set A, then prove that R^{-1} is an equivalence relation in the set A.

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Unit-II

2. (*a*) Explain lattice and their types.

(*b*) Draw a circuit for the following Boolean function and replace it by a simpler one :

$$F(x, y, x) = x \cdot z + \left[y \cdot (y' + z) \cdot (x' + x \cdot z') \right]$$

(*c*) In a Boolean algebra, show that if $a + b = a + c$ and $ab = ac$ then $b = c$.

Unit-III

3. (*a*) Show that the set of four fourth roots of unity form an abelian group with respect to multiplication.

(*b*) Prove that the order of each subgroup of a finite group is divisor of the order of the group.

(*c*) Prove that every field is an integral domain.

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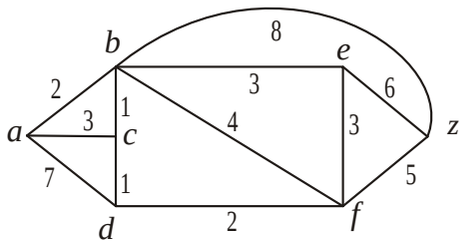
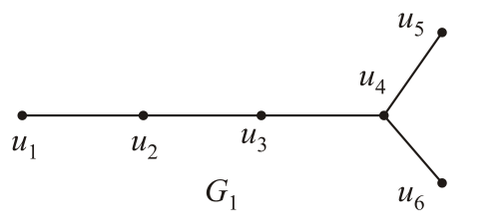
Unit-IV

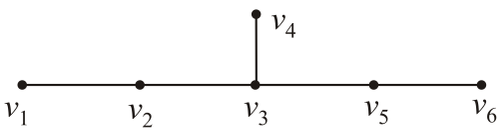
4. (*a*) Find shortest path of the following graph using Dijkstra's algorithm :



(*b*) What is isomorphic graph ? Test the following graph is isomorphic or not.



G_1



G_2

(*c*) Prove that the sum of the degrees all vertics in a graph *G* is equal to twice the number of edges in *G*.

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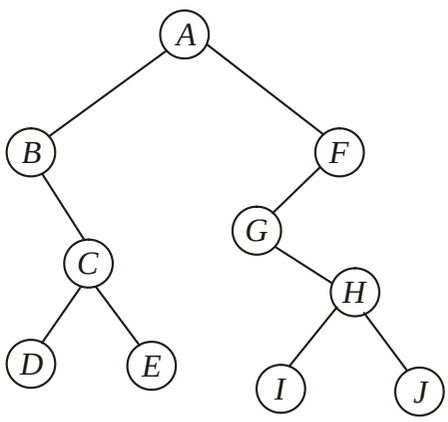
Unit-V

5. (*a*) Explain tree traversal and find inorder, preorder and postorder of the following tree.



(*b*) Prove that a tree with n vertices has $(n-1)$ edges.

(*c*) Write a note on application of trees in cumputer science.

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