

**B.Tech Odd Semester (CBCS) Exam.,
December—2016**

INFORMATION TECHNOLOGY

(3rd Semester)

Course No. : IT-301

(Discrete Mathematics and Graph Theory)

Full Marks : 75

Pass Marks : 30

Time : 3 hours

- Note :*
1. The figures in the margin indicate full marks for the questions.
 2. Attempt **five** questions, selecting **one** from each Unit.
 3. Begin each answer in a new page.
 4. Answer parts of a question at a place.
 5. Assume reasonable data wherever required.

UNIT—I

1. (a) For the following sets $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$ show their complements, difference and symmetric difference. Also, draw the respective Venn diagram. 5

- (b) How is a set inductively defined? Using inductive definition show that $a^m a^n = a^{m+n}$. 3+7=10

2. (a) Define composition of relations with an example. Distinguish between surjective, injective and bijective functions with example. 3+6=9

- (b) In a survey of 120 peoples, it was found that : 65 read Times magazine, 45 read India Today, 42 read The Week, 20 read Times of India Today, 25 read Times and The Week and 15 read India Today, The Week and 8 read all three of them. Compute the following : 6

- (i) Number of people who read at least one magazine.
- (ii) Number of people who read only one magazine.
- (iii) Fill the correct number of people in eight regions of a Venn diagram.

UNIT—II

3. (a) What are monotonic increasing and decreasing functions? Show graphically. 4

(3)

- (b) Define Boolean algebra. Find the minimal product and prime implicants of the following expression :

$$E \quad xyz \quad xyz \quad x yz \quad x y z \quad x y z$$

Draw the logic circuit for E . $2+6+3=11$

4. (a) Write the algorithm to find the consensus method of prime implicants. 6
- (b) Write the algorithm for finding sum of product (SOP) of a Boolean expression. Write the sum of products of $E = z(x + y) + y$. $4+5=9$

UNIT—III

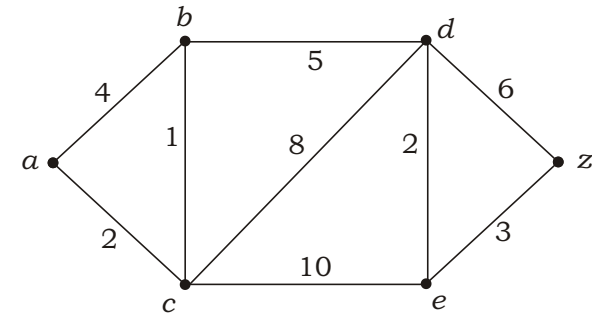
5. (a) Define the following : 5
Ring, group, subgroup, monoids and semi monoids
- (b) Prove the De Morgan's laws used in propositional logic. Verify if the following statement is a tautology :
 $(a + b) (a + b) (a + b)$ $4+6=10$
6. (a) Define the two quantifiers used in propositional logic. Give examples. 5

(4)

- (b) How are CNF and DNF defined? Let the wff f be $a + (b + c)$. Find the CNF and DNF of f . $4+6=10$

UNIT—IV

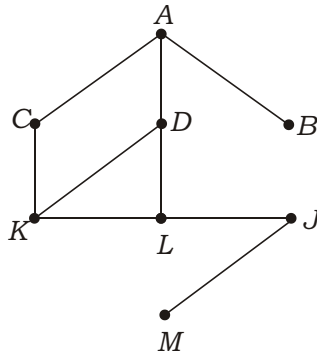
7. (a) Use Dijkstra's algorithm to find the shortest distance between a and z in the following graph : 8



- (b) Explain in details breadth-first searching (BFS) technique with an example. 7
8. (a) Define the following : 5
walk, trail, graph isomorphism, complete graph and degree of a directed graph.

(5)

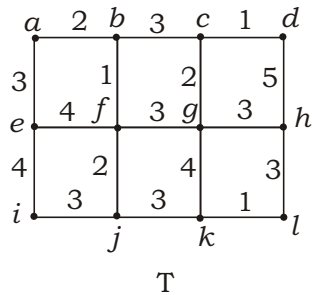
(b) Write the depth-first searching algorithm. Show how DFS is performed in the graph below : 4+6=10



UNIT—V

9. (a) Define the following : 6
tree, complete binary tree, spanning tree, postfix, infix and prefix polish notations.

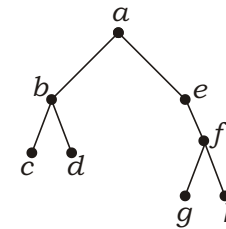
(b) Use Prim's algorithm to find the minimum spanning tree for the tree T given below : 9



T

(6)

10. (a) Show the preorder, inorder and postorder traversals of the tree below : 6



(b) For the tree T in Q. No. 9(b), find the minimum spanning tree using Kruskal's algorithm. 9
