

Total No. of Questions—8]

[Total No. of Printed Pages—7

<b>Seat No.</b>	
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**[4657]-580**

**S.E. (Computer Engineering) (I Semester) EXAMINATION, 2014**

**DISCRETE STRUCTURES**

**(2012 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

**N.B. :—** (i) Solve Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4 from  
Section I.

(ii) Solve Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8 from  
Section II.

(iii) Figures to the right indicate full marks.

**SECTION I**

1. (a) Find DNF of  $((p \rightarrow q) \cap (q \rightarrow p)) \vee p$ . [4]

Find CNF of  $p \leftrightarrow (\sim p \vee \sim q)$

(b) Consider a set of integers 1 to 500. Find how many of these  
numbers are divisible by 3 or by 5 or by 11. [2]

(c) Show that the set of all divisors of 36 forms a lattice. [6]

P.T.O.

Or

2. (a) Explain concept of countably infinite set with example. [3]
- (b) Use mathematical induction to show that : [3]
- $n(n^2 - 1)$  is divisible by 24 where  $n$  is any odd +ve number.
- (c) Consider the following relation on  $\{1, 2, 3, 4, 5, 6\}$  :  $R = \{(i, j) : |i - j| = 2\}$ . Is  $R$  transitive ? Is  $R$  reflexive ? Is  $R$  symmetric ? [2]
- (d) Let  $R$  be the relation on the set  $A = \{a, b, c, d, e, f\}$  and  $R = \{(a, c), (b, d), (c, a), (c, e), (d, b), (d, f), (e, c), (f, d)\}$ . Find the transitive closure of  $R$  using Warshall's algorithm. [4]
3. (a) (i) Prove that every cyclic group is an abelian group. [3]
- (ii) Explain Group Homomorphism and Isomorphism of Group.  
Take suitable example. [3]
- (b) (i) Under what condition  $K_{m, n}$  will have Eulerian circuit ? [4]
- (ii) How many colours are required to colour  $K_{m, n}$ . ? Why ? [2]

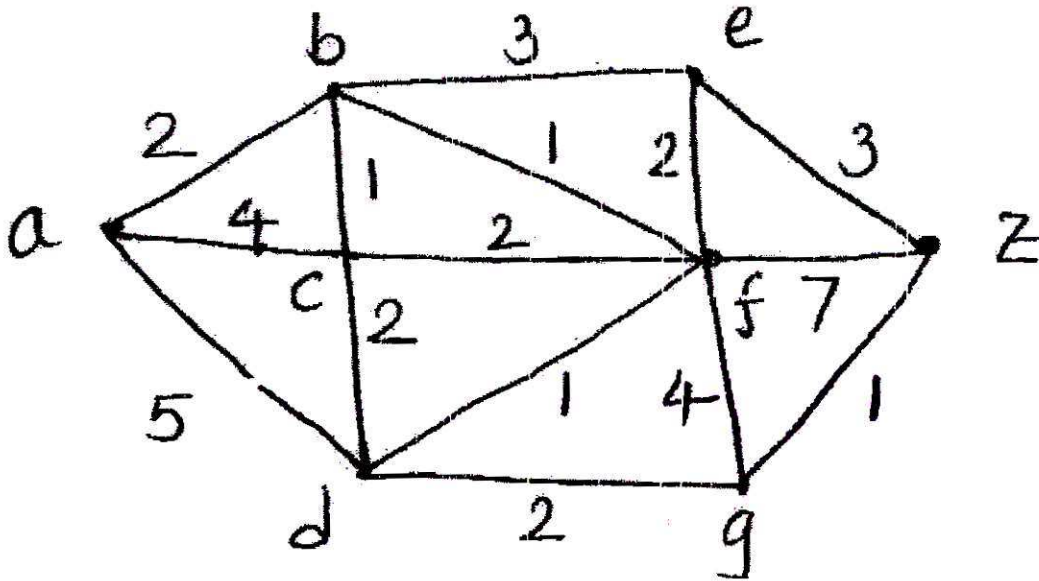
Or

4. (a) Prove that :

$$((a + b\sqrt{2}), +, *)$$

where  $a, b \in \mathbb{R}$  is integral domain. [6]

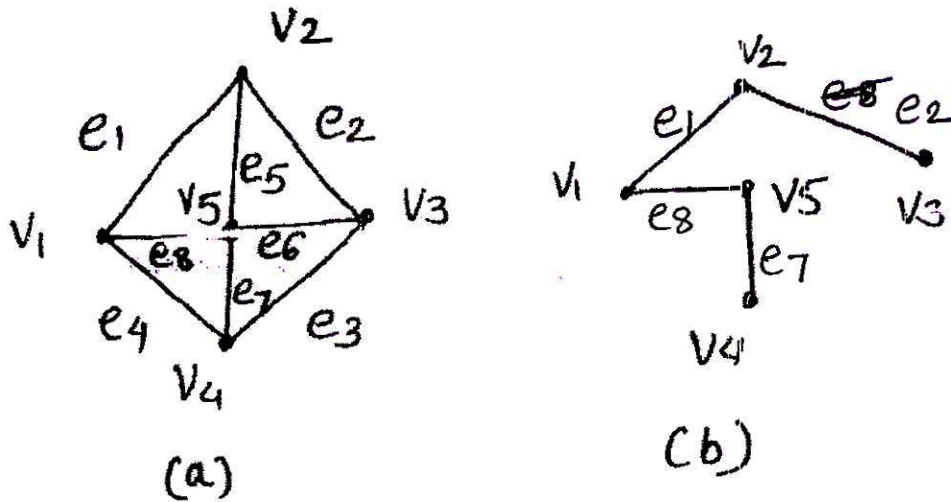
(b) Find the shortest path between  $a-z$  for the graph given in figure below using Dijkstra's algorithm. [6]



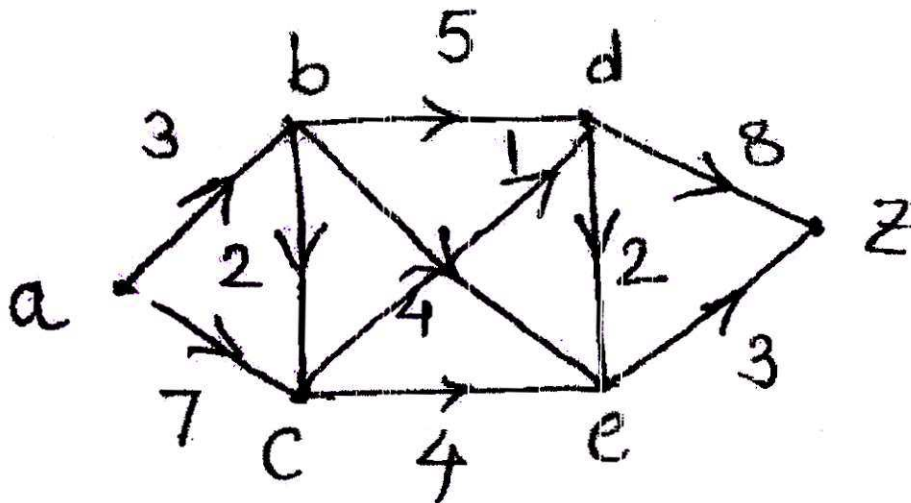
### SECTION II

5. (a) Prove that the number of vertices is one more than the number of edges in a tree. [3]

- (b) Find out fundamental cutsets of the following graph with respect to given spanning tree : [3]

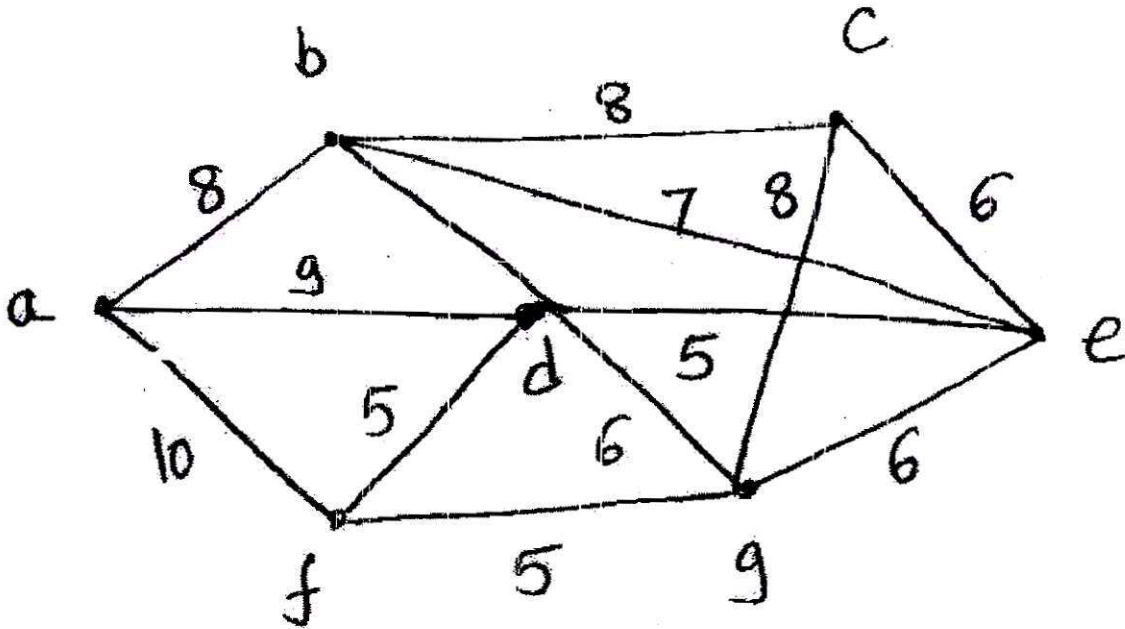


- (c) Use labelling procedure to find a maximum flow in the transport network given in the following figure. Determine the corresponding minimum cut. [7]



Or

6. (a) Find minimum spanning tree for graph given in the following figure using Prim's algorithm. [7]



- (b) For the following set of weights, construct optimal binary prefix code : [4]

$\alpha$	5
$\beta$	6
$\gamma$	6
$\delta$	11
$\epsilon$	20

- (c) Define rooted tree. [2]

7. (a) A box contains 6 white and 6 black balls. Find number of ways 4 balls can be drawn from the box if : [6]
- (i) Two must be white
- (ii) All of them must have same colour.
- (b) Two computers A and B are to be marketed. A salesman who is assigned the job of finding customers for them has 60 percent and 40 percent chances respectively of succeeding in case of computer A and B. The two computers can be sold independently. Given that he was able to sell at least one computer, what is the probability that computer A has been sold ? [7]

*Or*

8. (a) Out of 5 males and 6 females a committee of 5 is to be formed. Find the number of ways in which it can be formed so that among the person chosen in the committee there are :
- (i) exactly 3 males and 2 females
- (ii) at least 2 males and one female. [6]

(b) The probability that a trainee will remain in a company is 0.6. The probability that the employee earns more than Rs. 10,000 per month is 0.5. The probability that an employee is a trainee who remains within the company or who earns more than Rs. 10,000 per month is 0.7. What is the probability that an employee earns more than Rs. 10,000 per month ? Given that he is a trainee who stayed with the company. [7]