

Total No. of Questions—8]

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**[5252]-561**

**S.E. (Computer) (First Semester) EXAMINATION, 2017**

**DISCRETE MATHEMATICS**

**(2015 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

- N.B. :**
- (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.
  - (ii) Figures to the right indicate full marks.
  - (iii) Assume suitable data, if necessary.

1. (a) Define the following with proper set notations and examples : [6]

- (i) Membership
- (ii) Proper subset
- (iii) Power sets
- (iv) Empty sets
- (v) Cardinality of sets
- (vi) Multisets.

(b) What are relations and functions. Given a Relation  $R = \{(1, 4), (2, 2), (3, 10), (4, 8), (5, 6)\}$  and check whether the following relations  $R_1, R_2, R_3$  &  $R_4$  is a function or not.

$$R_1 = \{(1, 4), (2, 4), (3, 4), (4, 4), (5, 4)\}$$

$$R_2 = \{(1, 2), (2, 4), (2, 10), (3, 8), (4, 6), (5, 4)\}$$

$$R_3 = \{(1, 6), (2, 2), (4, 4), (5, 10)\}$$

$$R_4 = \{(1, 6), (2, 2), (3, 2), (4, 4), (5, 10)\}$$

[6]

P.T.O.

Or

2. (a) Let A and B are two sets. If  $A \subseteq B$ , then prove that  $P(A) \subseteq P(B)$ , where  $P(A)$  and  $P(B)$  are power sets of A and B sets. [6]
- (b) Define the closure of Relation. Discuss about the following closure properties with examples : [6]
- (i) Reflexive closure
  - (ii) Symmetric closure
  - (iii) Transitive closure.
3. (a) Explain the rule of sum and products with examples. [4]
- (b) Find out how many 5-digit number greater than 30,000 can be formed from the digits 1, 2, 3, 4, 5. [4]
- (c) Explain the directed and undirected graph with suitable example. [4]

Or

4. (a) Find the number of permutations which can be made with the letters of the word ENGINEERING. [4]
- (b) Explain the Dijkstra's Algorithm in detail. [4]
- (c) Define Subgraph.

Determine whether  $H = H' = (V', E')$  is a subgraph of  $G(V, E)$  shown in Fig. 4.c : [4]

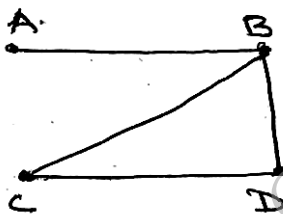
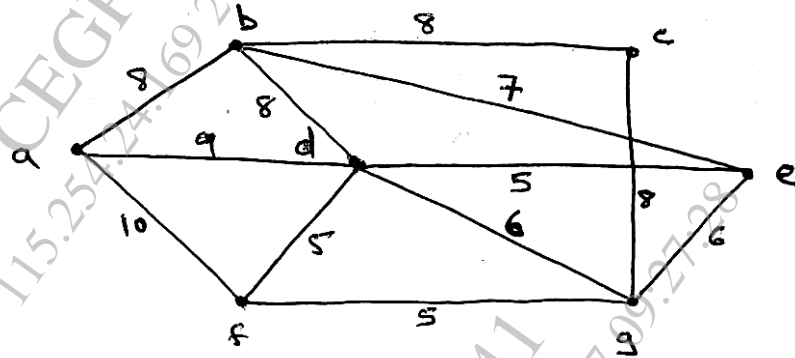


Fig. 4 (c) Graph G

- (i)  $V' = \{A, B, F\}$   
 $E' = \{(A, B), (A, F)\}$   
(ii)  $V' = \{B, C, D\}$   
 $E' = \{(B, C), (B, D)\}$

5. (a) Use Prim's Algorithm to find the minimum spanning tree for the connected weighted graph G as shown in Fig. 5.a [7]

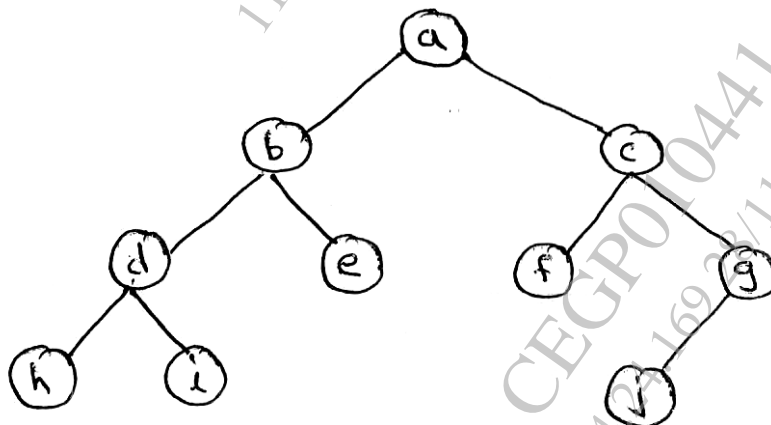


**Fig. 5. a Graph G connected weighted Graph**

- (b) Explain any *two* of the following : [6]  
(i) Min-max tree case study  
(ii) Transport network  
(iii) Decision tree.

Or

6. (a) Explain the Kruskal's Algorithm in detail. [7]  
(b) Find the pre, post and inorder traversal of a tree shown in Fig. 6.b. [6]



**Fig. 6. b Tree**

7. (a) Consider the set  $A = \{1, 3, 5, 7, 9, \dots\}$  i.e. a set of odd positive integers. Determine whether  $A$  is closed under :
- (i) Addition
  - (ii) Multiplication. [4]
- (b) Check whether the algebraic system  $(A, *)$  whose table is given below is a SEMI Group. [4]

$*$	$a$	$b$	$c$
$a$	$a$	$b$	$c$
$b$	$a$	$c$	$b$
$c$	$a$	$b$	$c$

- (c) Discuss in brief about the Galois theory—Field theory and group theory. [5]

Or

8. Define Algebraic system. Explain the steps to identify the following with suitable example : [13]
- (i) Monoid
  - (ii) Abelian Group
  - (iii) Ring.