Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[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]

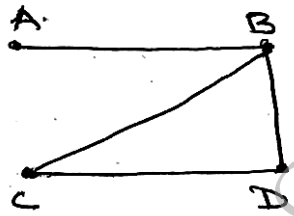

Fig. 4 (*c*) Graph G

(*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]

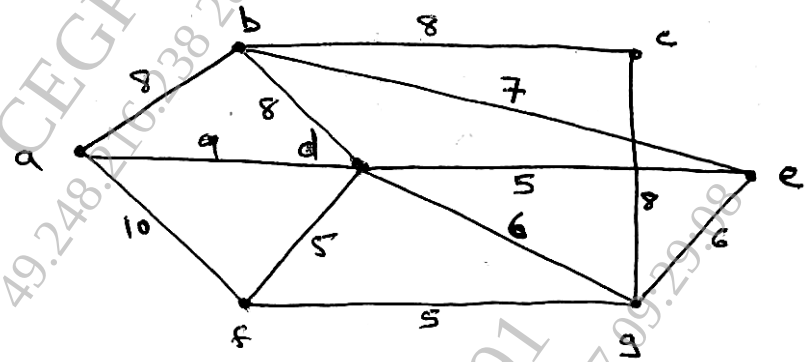

Fig. 5. *a* Graph G connected weighted Graph

(*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]

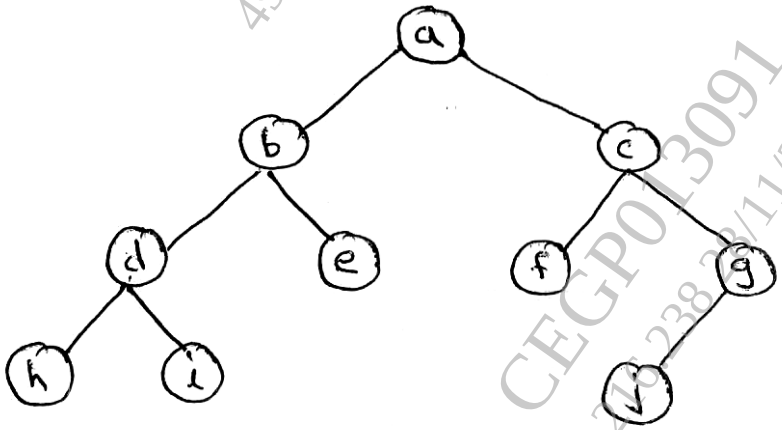

Fig. 6. *b* Tree

7. (*a*) Consider the set A = {1, 3 5, 7, 9, ...} 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.