Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

Seat No.	

[5152]-561

S.E. (Computer) (I Sem.) EXAMINATION, 2017

DISCRETE MATHEMATICS

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Figures to the right indicate full marks.

(*ii*) Assume suitable data, if necessary.

1. (*a*) Explain the concept of countably infinite set with example. [3]

(*b*) Use mathematical induction to show that, for all $n \geq 1$.

$$1+2+3+\ldots.+n=\frac{n(n+1)}{2}.$$ [3]

(*c*) Let A = {1, 2, 3, 4} consider partition

$$P = \{\{1,2,3\}, \{4\}\},$$

of A. Find the equivalence relation R on A determined by P. [3]

(*d*) Let A = {1, 2, 3} R is the relation on A whose matrix is :

$$M_R = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

show that R is transitive. [3]

Or

P.T.O.

2. (*a*) (*i*) Find DNF of :

$$((p \to q) \cap (q \to p)) \vee p \,.$$

(*ii*) Find CNF of :

$$p \leftrightarrow (\sim p \vee \sim q) \,.$$ [3]

(*b*) In the survey of 260 college students, the following data were obtained :

64 had taken a maths course,

94 had taken a cs course,

58 had taken a business course,

28 had taken both a maths and a business course,

26 had taken both a maths and a cs course,

22 had taken both a cs and a business course,

14 had taken all types of courses.

How many students were surveyed who had taken none of the three types of courses. [3]

(*c*) Let A = Z^+ the set of positive integers, and let

$$R = \{(a, b) \in A \times A |\ a \text{ divides } b\}$$

Is R symmetric, asymmetric *or* antisymmetric. [3]

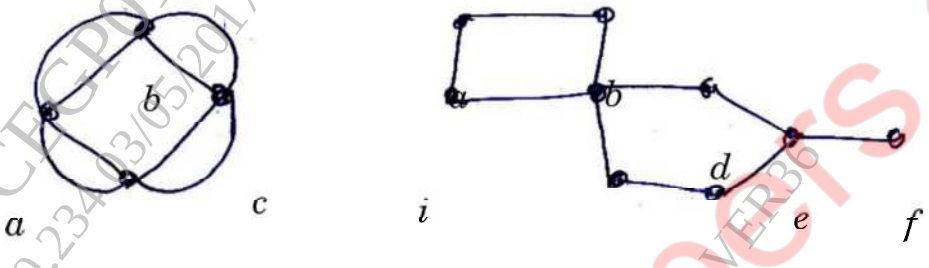
(*d*) Find transitive clousure using Warshall algorithm :

$$M_R = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$ [3]

3. (*a*) How many words of three distinct letters can be formed from the letters of the word MAST ? [3]

(*b*) How many different seven-person committees can be formed each containing three women from an available set of 20 women and four men from an available set of 30 women. [3]

(*c*) Check whether the graph has an Euler circuit, Euler path, justify : [3]



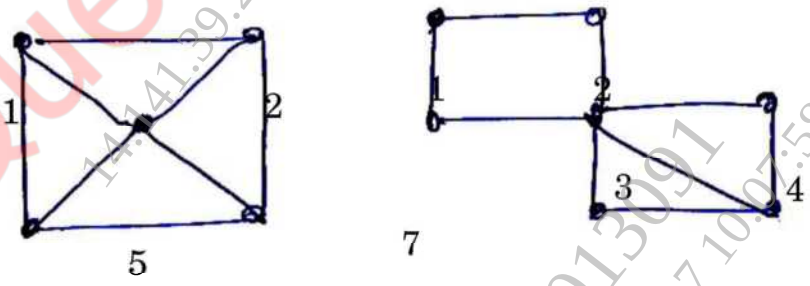
(Graph G_1) *Or* (Graph G_2)

(*d*) How many colours required to colour k_m, g_n, why ? [3]

4. (*a*) How many distinguishable words that can be formed from the letters of MISSISSIPPI ? [3]

(*b*) Compute the numbeer of distinct five-card hands that can be dealt from a deck of 52 cards. [3]

(*c*) Determine whether the following graph has a Hamiltonian circuit or Hamiltonian path. [3]

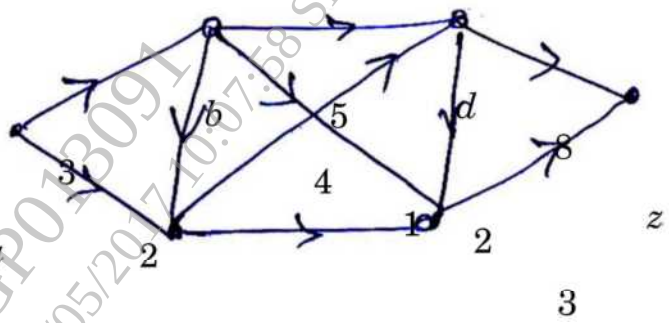


(Graph G_1) (Graph G_2)

(*d*) Write 5 applications of graph theory in the field of data analytics. [3]

5. (*a*) Use labeling procedure to find a maximum flow in the transpor;t network given in the following figure. Determine the corresponding

minimum cut. [7]



(*b*) Explain the following : [6]

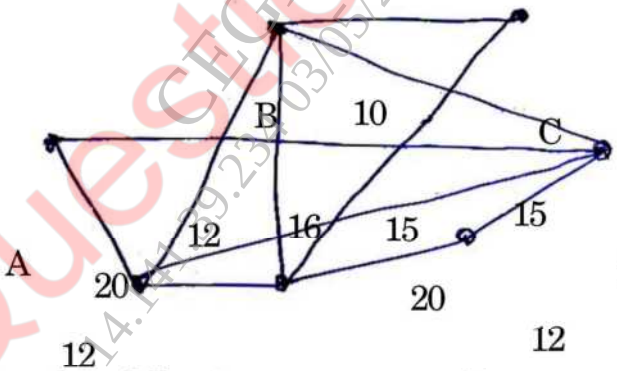
(1) Difference between binary tree and binary search tree.

(2) Rooted tree

(3) Cut-sets.

Or

6. (*a*) Find minimum spanning tree for given graph using Krustkal's algorithm. [6]



(*b*) Explain the following terms : [7]

(*i*) Application of cutset in computer engineering domain

(*ii*) Prefix code construction using Huffman coding.

(*iii*) Properties of trees.

7. (*a*) Prove that :

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

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

(*b*) Explain isomorphism ahnd homomorphism of two semigroups. [3]

(*c*) Prove that every cyclic group is an abelian group. [4]

Or

8. (*a*) Let G be set of all non-zero real numbers and let :

$$a * b = \frac{ab}{2},$$

show that (G, *) is an abelian group. [6]

(*b*) Explain Galois theory. [3]

(*c*) Explain properties of binary operations. [4]