C181

B. Tech. EXAMINATION, 2020

(Third Semester)

(B Scheme) (Re-appear Only)

(IT)

IT201B

DISCRETE MATHEMATICAL STRUCTURES

Time : 2½ Hours]　　　　[*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Four* questions in all. All questions carry equal marks.

1. Let A be a set with 10 distinct elements :

   (a) How many different binary relations on A are there ?

   (b) How many of them are reflexive ?

   (c) How many of them are symmetric ?

   (d) How many of them are reflexive and symmetric ?

   (e) How many of them are total ordering relation ?

2. (a) Show that the transitive closure of a symmetric relation is symmetric. Is the transitive closure of a antisymmetric relation is always antisymmetric.

   (b) Write a note on Multisets.

3. Consider the graph shown in fig. below :
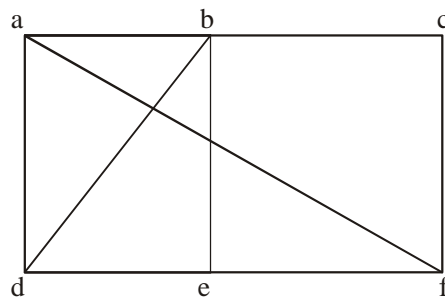
Give an example of the following :

(a) An elementary path

(b) A simple path which is not elementary

(c) A simple circuit

(d) A path which is not simple

(e) A circuit which is not simple.

4. (a) What is meant by Eulerian and Hamiltonian circuits ? Draw a graph :

   (i) That has both an Euler circuit and a Hamiltonian circuit.

   (ii) That has neither an Euler circuit nor a Hamiltonian circuit.

(b) Show that if in a graph G ther exist and only one path between every pair of vertices, then G is a tree.

5. (a) From the following formulae find out tautology, contingency and contradiction :

(i) $\neg(A \rightarrow B) \vee (\neg A \vee (A \wedge B))$

(ii) $(H \rightarrow (I \wedge J)) \rightarrow \neg(H \rightarrow I)$

(iii) $(P \leftrightarrow Q) \cong (P \wedge Q) \vee (\neg P \wedge Q)$

(b) Prove that the units of a ring R form a group under multiplication.

6. Explain the following :

(a) Monoid

(b) Cosets

(c) Cyclic Group

(d) Automorphism in Groups

(e) Semigroups.

7. (a) Solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r+2} = 0$ with the initial conditions $a_0 = 3$ and $a_1 = 3$.

(b) Explain Isomorphism and Homomorphism with suitable example.

8. Write notes on the following :

(a) Permutations and Combination

(b) Homogeneous solution

(c) Particular solutions.