

**BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)**  
**B. Tech. Sem - III COMPUTER SCIENCE & ENGINEERING AI&ML : SUMMER : 2024**  
**SUBJECT: DISCRETE MATHEMATICAL STRUCTURES**

Day : Wednesday  
Date : 08/05/2024

S-23935-2024

Time : 02:30 PM-05:30 PM  
Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non – programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

- Q.1** In a survey of 260 college students, following data were obtained. (05)  
64 had taken a mathematics course. 94 had taken computer science course. 58 had taken a business course. 28 had taken both mathematics and business course. 26 had taken both mathematics and computer science course. 22 had taken both computer science and business course. 14 had taken all 3 types of courses.
- (i) How many students were surveyed who had taken none of 3 types of courses?
  - (ii) How many students had taken only a computer science course?

**OR**

Write note on Quantifiers. Write the following statements in symbolic form, using quantifiers (10)

- i) All students have taken a course in communication skills.
- ii) There is a girl student in the class who is also a sports person.
- iii) Some students are intelligent, but not hard working.

- Q.2** Explain Warshwall's algorithm. Let  $A = \{1,2,3,4,5\}$  and let  $R$  be a relation on  $A$  Such that  $R = \{(1,1), (1,4), (2,2), (3,4), (3,5), (4,1), (5,2), (5,5)\}$  Find transitive closure of  $R$  by Warshwall's algorithm. (10)

**OR**

Define Equivalence relation. Let  $Z$  be set of integers. Define  $R$  on  $Z$  if 6 divides  $(a-b)$ . (10)  
Show that  $R$  is equivalence relation. Find  $Z/R$ .

- Q.3** Determine the probability  $P$  of each event: (10)
- i) An even number appears in the toss of a fair die.
  - ii) One or more heads appear in the toss of three fair coins.
  - iii) A red marble appears in random drawing of one marble from a box containing four white, three red and five blue marbles.

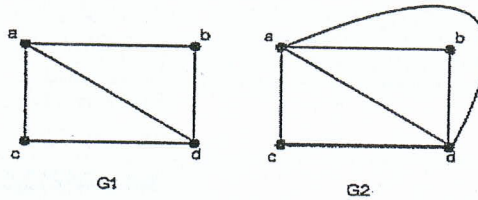
**OR**

Five boys and five girls are to be seated in a row. In how many ways can they be seated if (10)

- i) All boys must be seated in the five left- most seats.
- ii) No two boys can be seated together.

**P.T.O.**

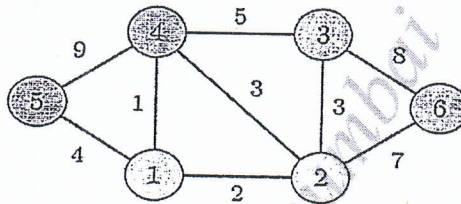
- Q.4 Find out Euler Path, Euler Circuit, Hamiltonian Path and Hamiltonian Circuit for following graphs G1 and G2. (10)



OR

Define planar graph. What are the necessary and sufficient (OS) Conditions to exist Euler path, Euler circuit and Hamiltonian Circuit? (10)

- Q.5 Construct minimum cost spanning tree for following graph using Prim's method and Kruskal's method. (10)



OR

- a) Prove that a tree with  $n$  vertices has  $(n-1)$  edges. (05)
- b) Determine number of vertices in following graph  $G$ : (05)
- $G$  has 9 edges and all vertices have degree 3.
  - $G$  has 10 edges with 2 vertices of degree 4 and all other have degree 3.
- Q.6 a)  $R = \{0,2,4,6,8\}$ . Show that  $R$  is a commutative ring under addition and multiplication modulo 10. Verify whether it is field or not. (05)
- b) Let  $L$  be the bounded distributive lattice. Prove that if complement exist Then it is unique. (05)

OR

- In any Ring  $(R, +, \cdot)$  prove that (10)
- The zero-element  $z$  is unique.
  - The additive inverse of each ring element is unique.

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