

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



**GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING FOR WOMEN  
(Autonomous)**

(Affiliated to Andhra University, Visakhapatnam)

**IIB.Tech. - I Semester Regular Examinations, Nov – 2025**

**DISCRETE MATHEMATICAL STRUCTURES**

(Common to CSE, CSE (AI&ML), IT)

1. All questions carry equal marks
2. Must answer all parts of the question at one place

**Time: 3Hrs.**

**Max Marks: 70**

**UNIT-I**

1. a. Show that the relation  $R = \{(x, y) / x-y \text{ is an integer}\}$  is an equivalence relation. (7M)
- b. Let  $A$  be a given finite set and  $P(A)$  its power set. Let  $\subseteq$  be the inclusion relation on the elements of  $P(A)$ . Draw Hasse diagrams of  $(P(A), \subseteq)$  for  $A = \{a, b, c\}$  (7M)

**OR**

2. a. (i). Describe the transitive closure of a relation with an example? (3M)
- (ii). Explain about the types of functions in detail. (4M)
- b. Determine the number of positive integers  $n$  such that  $1 \leq n \leq 100$  and  $n$  is not divisible by 2, 3 or 5. (7M)

**UNIT-II**

3. a. (i). Show that  $P \rightarrow (Q \rightarrow R) \Leftrightarrow (P \wedge Q) \rightarrow R$  (3M)
- (ii). Obtain the principal disjunctive normal forms of  $(P \wedge Q) \vee (\sim P \wedge R) \vee (Q \wedge R)$  (4M)
- b. Show the following premises are inconsistent. (7M)

If Jack misses many classes through illness, then he fails high school.

If Jack fails high school, then he is uneducated.

If Jack reads lot of books, then he is not uneducated.

Jack misses many classes through illness and reads lot of books'

**OR**

4. a. Show that  $R \rightarrow S$  can be derived from the premises  $P \rightarrow (Q \rightarrow S)$ ,  $\sim R \vee P$ , and  $Q$ . (7M)
- b. Symbolize the following argument and check for its validity: (7M)

Every living thing is a plant or an animal

David's dog is alive and it is not a plant

All animals have hearts

Therefore, David's dog has an heart

### UNIT-III

5. a. Prove by mathematical induction that for all integers  $n \geq 1$ : (7M)

$$1+3+5+\dots+(2n-1)=n^2$$

- b. Use the Euclidean Algorithm to find gcd of (414,662). (7M)

**OR**

6. a. Use the Chinese Remainder Theorem to solve the system of congruences: (7M)

$$x \equiv 2 \pmod{3}, \quad x \equiv 3 \pmod{4}, \quad x \equiv 2 \pmod{5}.$$

- b. State Fermat's Little Theorem and use it to find the remainder when  $7^{222}$  is divided by 13. (7M)

### UNIT-IV

7. a. Solve recurrence relation  $a_n = 3a_{n-1} + 2a_{n-2}$  for  $n \geq 2, a_0 = 1, a_1 = 2$  using characteristic roots? (7M)

- b. Solve the recurrence relation  $a_n = a_{n-1} + n$  where  $a_0 = 2$ , by substitution method. (7M)

**OR**

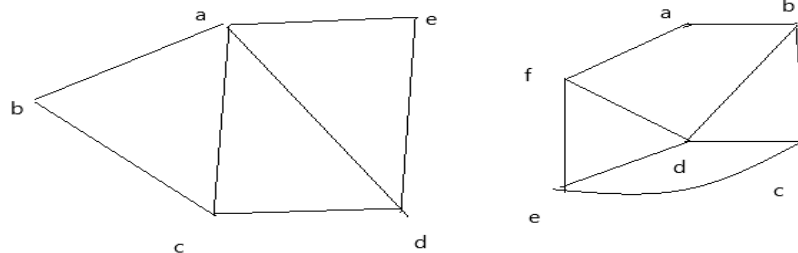
8. a. Solve the recurrence relation  $a_n - 7a_{n-1} + 10a_{n-2} = 0$  where  $n \geq 2$ , by generating functions. (10M)

- b. A coin is tossed 10 times. How many possible outcomes are there? (4M)

### UNIT-V

9. a. What is Graph Isomorphism? Discuss the Isomorphism of graphs with an example? (7M)

- b. (i) what is chromatic number of a graph? Find the chromatic number of the following graphs. (3M)



- (ii). Elaborate the Euler and Hamiltonian graphs? (4M)

**OR**

10. a. Explain the graph traversals (BFS and DFS) with an example? (7M)

- b. Using Prim's algorithm, to find a minimal spanning tree for the following weighted graph. (7M)

