Code: 23BS1305

II B.Tech - I Semester – Supplementary Examinations - MAY 2025

DISCRETE MATHEMATICS AND GRAPH THEORY
(Common for CSE, IT, AIML, DS)

Duration: 3 hours   Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
       2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
       3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
       4. All parts of Question paper must be answered in one place.

PART – A

1.a)	Construct truth table for $P \rightarrow (Q \rightarrow R)$.
1.b)	What is the Difference between CNF and PCNF?
1.c)	Write any two rules of Inferences.
1.d)	Explain universal quantifier.
1.e)	Define a recurrence relation.
1.f)	Write the general form of Homogeneous recurrence relation of second order.
1.g)	Define Equivalence Relation.
1.h)	Define a Graph.
1.i)	Define a spanning tree.
1.j)	What is a planar graph? Is $K_{2,3}$ planar graph?

PART – B

					Max. Marks
		UNIT-I			
2	a)	What do you mean by Well Formed Formula? Explain about Tautology with example.			5 M
	b)	Obtain principal conjunctive normal form for the formula $p \lor (\sim p \to (q \lor (\sim q \to r)))$.			5 M
		OR			
3	a)	Construct truth table for $(P \land Q) \to R$.			5 M
	b)	Define PDNF and find PDNF for $(\sim P \leftrightarrow R) \land (Q \leftrightarrow P)$.			5 M
		UNIT-II			
4	a)	Verify the validity of the following inference: i) All integers are rational numbers. ii) some integers are powers of 3 Therefore, Some rational numbers are powers of 3.			5 M
	b)	Show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny," "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "We will be home by sunset."			5 M
		OR			

5	a)	Show that the premises "Everyone in this discrete mathematics class has taken a course in computer science" and "Marla is a student in this class" imply the conclusion "Marla has taken a course in computer science."	5 M
	b)	Give a direct proof for "If n is an odd integer, then n^2 is odd."	5 M

UNIT-III

6	a)	Solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2}$, where $a_0 = 4$ and $a_1 = 7$.	5 M
	b)	Solve the recurrence relation $a_n = 7a_{n-1} - 3a_{n-2} - 3a_{n3}$, where $a_0 = 5$, $a_1 = 3$, $a_2 = 6$.	5 M

OR
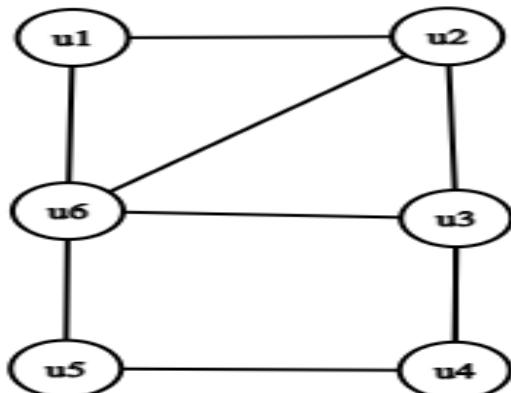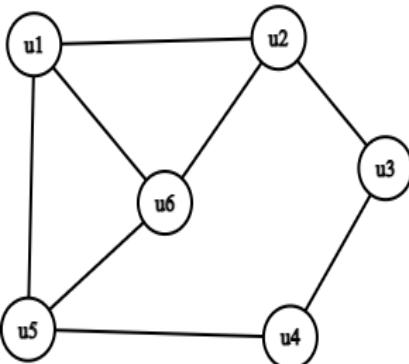
7	a)	Solve the recurrence relation $a_n - a_{n-1} - 12a_{n-2} = 0$, $a_0 = 0$, $a_1 = 1$.	5 M
	b)	Solve the recurrence relation $a_n = 2a_{n-1} - 5\ a_{n-2}$, $a_0 = 2$, $a_1 = 3$. Also calculate a_6.	5 M

UNIT-IV

8	a)	Prove that $(S, \leq)$ is a Lattice, where $S = \{1,2,5,10\}$ and $\leq$ is for divisibility. Prove that it is also a Distributive Lattice?	5 M
	b)	Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = ((x, y)/x - y\ is\ divisible\ by\ 3\}\ in\ X$. Show that R is an equivalence relation.	5 M

**OR**

9	a)	Consider the set A = {4, 5, 6, 7}. Let R be the relation ≤ on A. Draw the directed graph and the Hasse diagram of R.	5 M
	b)	Determine whether the given pair of graphs are isomorphic or not?	5 M

UNIT-V

10	Write Prim's and Kruskal's algorithms for find Minimal Spanning Tree of a Graph.	10 M

OR

11	Using BFS algorithm find spanning tree of the following graphs.	10 M