

Code: 23BS1305

II B.Tech I Semester – Supplementary Examinations – APRIL 2026**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.

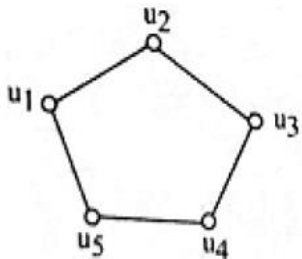
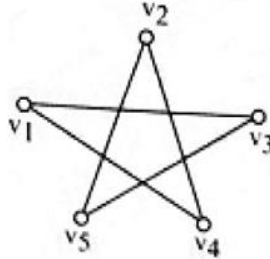
4. All parts of Question paper must be answered in one place.

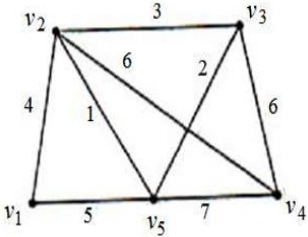
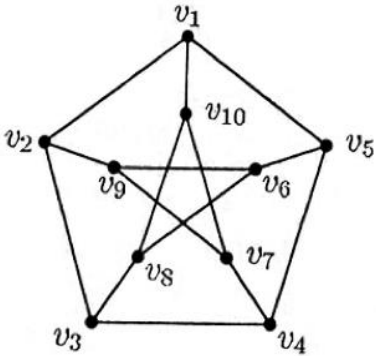
PART – A

1.a)	Define contradiction with an example.
1.b)	Obtain Disjunctive Normal Form(DNF) of $p \wedge (p \rightarrow q)$.
1.c)	Define consistency of premises.
1.d)	Symbolize the statement: “Some real numbers are irrational”.
1.e)	Define recurrence relation.
1.f)	Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 0$.
1.g)	Define an equivalence relation.
1.h)	Define lattice.
1.i)	Define tree with an example.
1.j)	Define minimal spanning tree.

PART – B

					Max. Marks
UNIT-I					
2	a)	Using truth table, show that $[(P \wedge Q) \vee (\sim R) \leftrightarrow P]$ is a tautology.			5 M
	b)	Obtain PCNF of $(\sim P \rightarrow Q) \wedge (R \leftrightarrow P)$.			5 M
OR					
3	a)	Prove that $(\sim P \leftrightarrow Q) \Leftrightarrow (P \vee Q) \wedge (P \wedge Q)$.			5 M
	b)	Obtain PDNF of $P \rightarrow [(P \rightarrow Q) \wedge \sim(\sim Q \vee \sim P)]$.			5 M
UNIT-II					
4	a)	Show that $R \rightarrow S$ can be derived from the following premises: $P \rightarrow (Q \rightarrow S)$, $\sim R \vee P$ and Q .			5 M
	b)	Prove or disprove the validity of the following argument: Some coins are dimes. All nickels are coins. Therefore, some nickels are dimes.			5 M
OR					
5	a)	Write the following quantified statements in symbolic form: (i) All men are mortal (ii) Every apple is red (iii) Every natural number is either even or odd.			5 M
	b)	By indirect proof, show that $P \rightarrow Q, Q \rightarrow R, \sim(P \wedge R), P \vee R \Rightarrow R$.			5 M

UNIT-III		
6	Solve $a_n = 6a_{n-1} - 12a_{n-2} + 8a_{n-3}, n \geq 3$ given $a_0 = 1, a_1 = 4$ and $a_2 = 28$ by the method of characteristic roots.	10 M
OR		
7	Find general solution of $a_{n+1} - 10a_n + 9a_{n-1} = 3^n, n \geq 1$ where $a_0 = 1, a_1 = 4$.	10 M
UNIT-IV		
8	a) Let $P(S)$ denote the power set defined on $S = \{1, 2, 3\}$. The relation R on $P(S)$ defined by XRY if and only if $X \subseteq Y$. Show that R is a partial order relation on $P(S)$.	5 M
	b) Find the transitive closure of the relation $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$	5 M
OR		
9	a) Let R be a relation defined on $A = \{1, 2, 3, 4, 6\}$ by aRb if and only if a is a multiple of b . Represent the relation matrix for R and draw its digraph.	5 M
	b) Show that the following graphs are isomorphic.  	5 M
UNIT-V		
10	a) Explain Breadth First Search algorithm with an example.	5 M

	b) Find the minimal spanning tree for the following weighted graph using Prim's algorithm: 	5 M
OR		
11	Define chromatic number of a graph. Find the chromatic number of the following graph. 	10 M