PVP 23

Code: 23BS1305

II B.Tech - I Semester – Regular / Supplementary Examinations
NOVEMBER 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.

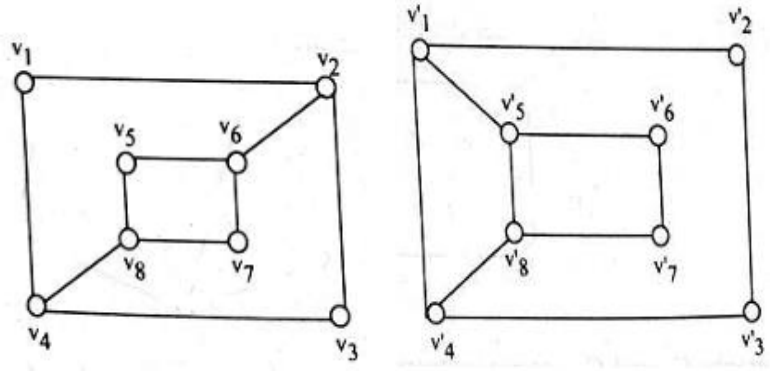
BL – Blooms Level CO – Course Outcome

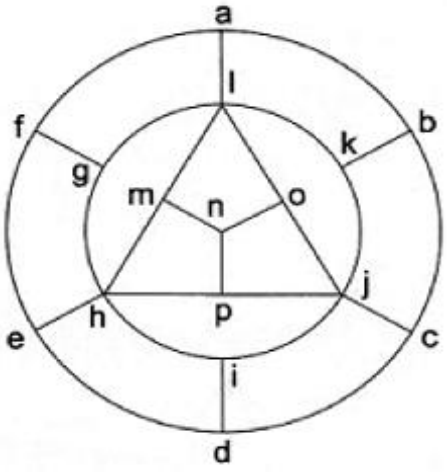
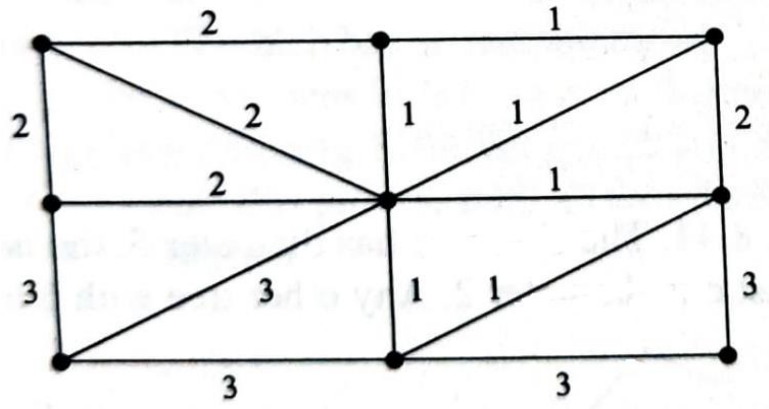
PART – A

		BL	CO
1.a)	Find the duality of the statement $(p \to q) \to r$.	L2	CO1
1.b)	Obtain Conjunctive Normal Form (CNF) of $\neg [p \to (q \vee r)]$.	L2	CO1
1.c)	Define Predicate with an example.	L2	CO1
1.d)	State Rules of Modus Ponens and Modus Tollens.	L2	CO1
1.e)	Write the general form of a third order non-homogeneous recurrence relation.	L2	CO1
1.f)	Solve the recurrence relation $a_n - 4a_{n-1} + 4a_{n-2} = 0$.	L3	CO3
1.g)	Define partially ordered set.	L2	CO1
1.h)	Draw the Hasse diagram for positive divisors of 12.	L2	CO1
1.i)	Define planar graph with an example.	L2	CO1
1.j)	Define chromatic number of a graph.	L2	CO1

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Prove that $\left[P\rightarrow(Q\rightarrow R)\right]\rightarrow\left[(P\rightarrow Q)\rightarrow(P\rightarrow R)\right]$ is a tautology.	L3	CO2	5 M
	b)	Obtain PCNF of $\sim(P\vee Q)\leftrightarrow(P\wedge Q)$.	L3	CO2	5 M
OR					
3	a)	Prove that $\neg(P\wedge Q)\rightarrow\left[\neg P\vee(\neg P\vee Q)\right]\Leftrightarrow(\neg P\vee Q)$.	L3	CO2	5 M
	b)	Obtain PDNF of $(\neg P\rightarrow Q)\wedge(Q\leftrightarrow P)$.	L3	CO2	5 M
UNIT-II					
4	a)	Show that $R\wedge(P\vee Q)$ is a valid conclusion from the premises $P\vee Q,\ Q\rightarrow R,\ P\rightarrow M$ and $\neg M$.	L3	CO2	5 M
	b)	Verify the validity of the following argument: Tigers are dangerous animals. There are tigers. Therefore, there are dangerous animals.	L3	CO2	5 M
OR					
5	a)	Write the following quantified statements in symbolic form: i. Some roses are yellow ii. All Russians are taller than all Americans iii. Some monkeys have no tail.	L2	CO2	5 M

	b)	Prove that $(\forall x)(P(x)\vee(\forall x)(Q(x) \Leftrightarrow (\forall x)(P(x)\vee Q(x))$ is logically valid.	L3	CO2	5 M
		UNIT-III			
6		Slove $a_{n+2}-5a_{n+1}+6a_n = 3n+4$ with $a_0 = 2,\ a_1 = 5$	L3	CO3	10 M
		OR			
7		Solve $a_r-7a_{r-1}+16a_{r-2}-12a_{r-3} = 0,\ r \geq 3$ with $a_0 = 1,\ a_1 = 4$ and $a_2 = 8$ by the method of characteristic roots.	L3	CO3	10 M
		UNIT-IV			
8		Define an equivalence relation. Let $\mathbb{Z}$ denote the set of integers and the relation R on $\mathbb{Z}$ be defined by aRb if and only if $a-b$ is an integer. Prove that R is an equivalence relation.	L3	CO4	10 M
		OR			
9	a)	Let R be a relation defined on $A=\{1,2,3,4,5\}$ by $R=\{(x,y)/x \geq y\}$. Verify whether R is partial ordered relation or not?	L4	CO4	5 M
	b)	Verify whether the following graphs are isomorphic or not? 	L4	CO4	5 M

		UNIT-V			
10	a)	Explain Depth First Search algorithm with an example.	L4	CO4	5 M
	b)	Show that the following graph is not Hamiltonian. 	L4	CO4	5 M
		OR			
11		Define minimal spanning tree. Find the minimal spanning tree for the following weighted graph using Krushkal's algorithm: 	L4	CO4	10 M