Register No : ___________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

MCA DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Master of Computer Applications

PMCVA105 - Mathematical Foundations of Computer Science

Regulations - 2024

Duration : 3 Hrs *Maximum:100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	Questions	BLT	CO	Marks
1.	Construct the truth table of $(p\vee \neg q) \to (p\wedge q)$.	L3	1	2
2.	Give the symbolic form of “Some men are giant”.	L2	1	2
3.	State the Pigeonhole principle.	L1	2	2
4.	How many cards must be selected from a deck of 52 cards to guarantee that at least 3 cards of the same suit are chosen?	L3	2	2
5.	An undirected graph G has 16 edges and all the vertices are of degree 2. Find the number of vertices.	L2	3	2
6.	Construct an Example of a bipartite graph which is Hamiltonian but not Eulerian	L3	3	2
7.	Show that every cyclic group is abelian.	L2	4	2
8.	Define kernel of a homomorphism.	L1	4	2
9.	Prove that the absorption laws are valid in a Boolean algebra	L3	5	2
10.	State the De Morgan’s laws in Boolean algebra.	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			Questions	BLT	CO	Marks
11.	a	i	Construct the symbolic form and negate the following statements. (i) Everyone who is healthy can do all kinds of work (ii) Some people are not admired by everyone (iii) Everyone should help his neighbors, or his neighbors will not help him	L4	1	8
		ii	Show that $r \to s$ can be derived from the premises $p \to (q \to s)$, $\neg r \vee p$ and q.	L4	1	8
			Or			
	b	i	Obtain the PDNF and PCNF of $(P\wedge Q) \vee (\neg P\wedge R)$.	L4	1	8
		ii	Prove that $\forall x(P(x) \vee Q(x)) \Rightarrow \forall x P(x) \vee \exists x Q(x)$ by indirect method.	L4	1	8
12.	a	i	Find the number of integers between 1 to 250 that are not divisible by any of the integers 2,3,5 and 7.	L3	2	8
		ii	Using generating functions, solve $a_n = 8a_{n-1}+10^{n-1}$ with $a_0 = 1$; $a_1 = 9$.	L3	2	8
			Or			

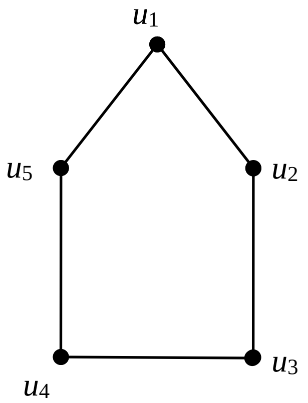
b i Prove by mathematical induction $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$. L3 2 8

ii How many permutations can be made out of the letters of the word "BASIC"? How many of those L3 2 8

(i) Begin with B?
(ii) End with C?
(iii) B and C occupy the end places?

13. a i Prove that the complement of a disconnected graph is connected. L5 3 8

ii Define isomorphism. Relate an isomorphism for the following the graphs. L2 3 8



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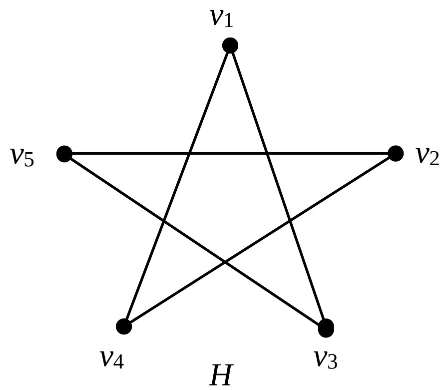
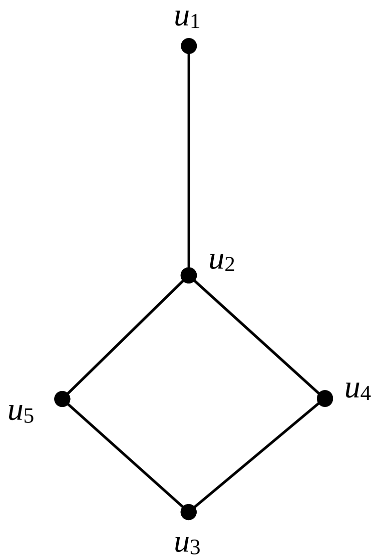


H

Or

b i Define a sub graph. Find all the subgraphs of the following graph by deleting an edge. L2 3 8



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ii Prove that a connected graph G is Euler graph if and only if every vertex of $G$is of even degree. L5 3 8

14. a i Show that every subgroup of a cyclic group is cyclic. L2 4 8

ii Let f: G,$*$) → (H,△) be group homomorphism then show that $Ker(f)$ is a normal subgroup. L4 4 8

Or

	b	i	Show that(Q +,$*$) is an abelian group where $*$ is defined as $a*b$ = $ab/2$, $\forall a$, $b \in Q$+ .	L2	4	8
		ii	Prove that the intersection of two subgroups of a group G is again a subgroup of G.	L4	4	8
15.	a	i	Let D30 = {1,2,3,5,6,10,15, 30} and let the relation R be divisor on D30. Find 1. All lower bounds of 10 and 15 2. all upper bounds of 10 and 15 3. Draw the Hasse Diagram 4. GUB, LUB of 10 and 15	L3	5	8
		ii	Show that a complemented, distributive lattice is a Boolean Algebra.	L2	5	8
			Or			
	b	i	Show that every chain is a distributive lattice.	L2	5	8
		ii	In a Boolean Algebra. Show that $(a*b)' = a' \oplus b'$ and $(a \oplus b)' = a' * b'$.	L3	5	8