SRM Institute of Science and Technology
Faculty of Engineering and Technology
DEPARTMENT OF CSE/ECE
Vadapalani Campus, Chennai 600026. Tamil Nadu
Academic Year: 2023-24 Semester: ODD

Mode of Exam
OFFLINE
SET-B

Test: CLAT-II
Course Code & Title: 18MAB302T - Discrete Mathematics for Engineers
Year & Sem.: III & V

Date: 04-10-2023
Duration: 90 min.
Max. Marks: 50

S.No	Course Outcome		Program Outcomes (PO)											
			1	2	3	4	5	6	7	8	9	10	11	12
1	CO1	Problem solving in sets, relations and functions	3	3	-	-	-	-	-	-	-	-	-	-
2	CO2	Solving problems in basic counting principles, inclusion exclusion and number theory	3	3	-	-	-	-	-	-	-	-	-	-
3	CO3	Solving problems of mathematical logic, inference theory and mathematical induction	3	3	-	-	-	-	-	-	-	-	-	-
4	CO4	Gaining knowledge in groups, rings and fields. Solving problems in coding theory	3	3	-	-	-	-	-	-	-	-	-	-
5	CO5	Gaining knowledge in graphs and properties. Learning about trees, minimum spanning trees and graph coloring	3	3	-	-	-	-	-	-	-	-	-	-
6	CO6	Learning mathematical reasoning, combinatorial analysis, algebraic structures and graph theory	3	3	-	-	-	-	-	-	-	-	-	-

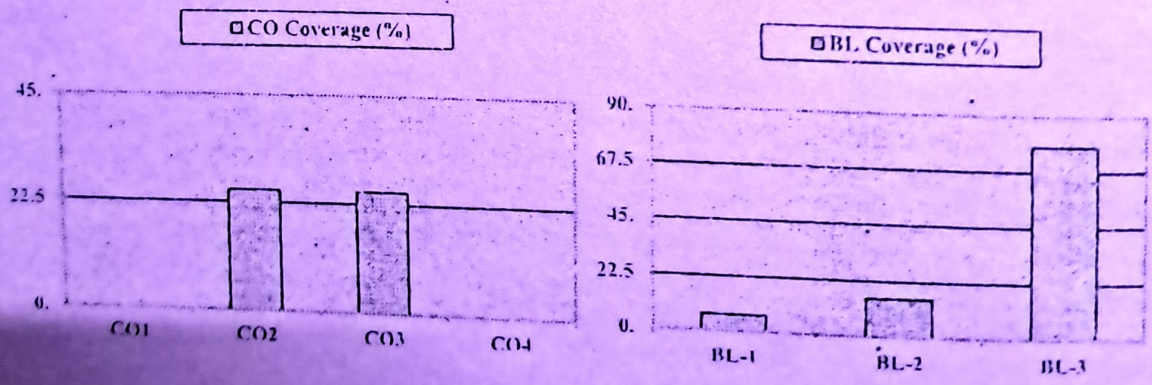
Part – A (10x01 = 10 Marks)
ANSWER ALL QUESTIONS

Q. No	Question	Marks	BL	CO	PO
1	In how many ways can 12 Children are sitting in row so that the boys and girls never come together? a) $10 \times 11!$ b) $12 \times 11!$ c) $11 \times 9!$ d) $12 \times 10!$	1	2	1	1
2	How many ways 2 students can be chosen from the class of 20 students? a) 180 b) 190 c) 240 d) 390	1	1	1	1
3	When 6 coins are tossed simultaneously, What is the number of the outcomes at most 2 of the coins will turn up as tails? a) 12 b) 24 c) 16 d) 15	1	1	1	1
4	A Bag contains 4 Red, 4 Black and 8 White balls. In how many ways balls can be taken with the same colour? a) 4! 4! 8! b) 4! 8! c) 3! 4! 4! 8! d) 2! 4! 4! 8!	1	2	1	1

5	The Pascal's identity in the theory of combination is ___ a) $nC_r + nC_{r-1} = (n+1)C_r$ b) $nC_r + nC_{r+1} = (n+1)C_r$ c) $nC_r - nC_{r-1} = (n+1)C_r$ d) $nC_r - nC_{r+1} = (n+1)C_r$	1	1	1	1
6	The contrapositive of $q \rightarrow p$ is ___ a) $p \rightarrow \neg q$ b) $\neg q \rightarrow \neg p$ c) $\neg p \rightarrow \neg q$ d) $\neg q \rightarrow p$	1	2	1	1
7	The statement $p \vee \neg p$ is a) identity b) complement c) contradiction d) tautology	1	2	1	1
8	The dual of $(p \wedge q) \vee \neg q \equiv p \vee \neg q$ is a) $(p \vee q) \vee \neg q \equiv p \vee \neg q$ b) $(p \vee q) \wedge \neg q \equiv p \wedge \neg q$ c) $(p \wedge q) \wedge \neg q \equiv p \wedge \neg q$ d) $(\neg p \wedge \neg q) \wedge \neg p \equiv p \wedge \neg q$	1	2	1	1
9	Every conditional statement is equivalent to a) contrapositive b) inverse c) converse d) implication	1	2	1	1
10	According to principle of mathematical induction, if $P(k+1) = m^{(k+1)} + 5$ is true then ___ must be true a) $P(k) = m^k + 5$ b) $P(k) = m^{(k+2)} + 5$ c) $P(k+1) = m^k + 5$ d) $P(k) = m^{(k-1)} + 5$	1	2	1	1
	Part – B (4 * 4= 16 Marks) **(Answer 4 out of 5 Questions)**				
11	In how many ways can a cricket team of eleven be chosen out of 15 players? How many of them will a) Include a particular player b) Exclude a particular player	4	3	1	1
12	Use the Euclidean algorithm to find gcd (1819,3587)	4	2	1	2
13	If we select 10 points in the interior of an equilateral triangle of side 1, show that there must be at least two points whose distance apart is less than 1/3	4	3	1	1
14	Show that $\neg p \vee q$, $\neg r \rightarrow \neg q$ and $\neg r \Rightarrow \neg p$ By the indirect method.	4	3	1	1
15	Derive $P \rightarrow (Q \rightarrow S)$ using the rule CP if necessary from $P \rightarrow (Q \rightarrow R)$, $Q \rightarrow (R \rightarrow S)$.	4	3	1	1
	Part – C (2 * 12 = 24 Marks)				

16.a	Find the number of integers between 1 and 500 both inclusive that are not divisible by any of the integers 2, 3, 5 and 7.	12	3	1	2
	[OR]				
16.b	Find gcd and lcm of 231, 1575. Verify that gcd(m,n).lcd(m,n)=mn and also express m and n	12	3	1	2
17.a	i) Show that $q \vee (p \wedge \neg q) \vee (\neg p \wedge \neg q)$ is tautology. a) Without truth table. b) With truth table. ii) Prove by mathematical induction $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}, n \geq 1$	 6 6	 3 3	 1 1	 2 2
	[OR]				
17.b	Symbolize the following statements and then use the method of derivation: If A works hard, then either B or C will enjoy themselves. If B enjoys himself, then a will not work hard. If D enjoys himself, then C will not. Therefore, If A works hard, D will not enjoy himself.	12	3	1	2

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions



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Academic Year: 2023-24 Semester: ODD

Mode of Exam
OFFLINE
SET-A

Test: CLAT-3
Course Code & Title: 18MAB302T - Discrete Mathematics for Engineers
Year & Sem.: III & V

Date: 02-11-2023
Duration: 90 min.
Max. Marks: 50

S.No	Course Outcome		Program Outcomes (PO)											
			1	2	3	4	5	6	7	8	9	10	11	12
1	CO1	Problem solving in sets, relations and functions	3	3	-	-	-	-	-	-	-	-	-	-
2	CO2	Solving problems in basic counting principles, inclusion exclusion and number theory	3	3	-	-	-	-	-	-	-	-	-	-
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5	CO5	Gaining knowledge in graphs and properties. Learning about trees, minimum spanning trees and graph coloring	3	3	-	-	-	-	-	-	-	-	-	-
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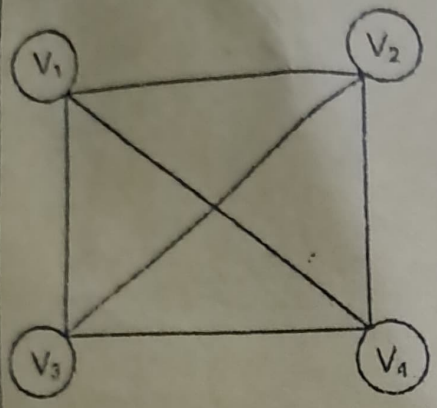
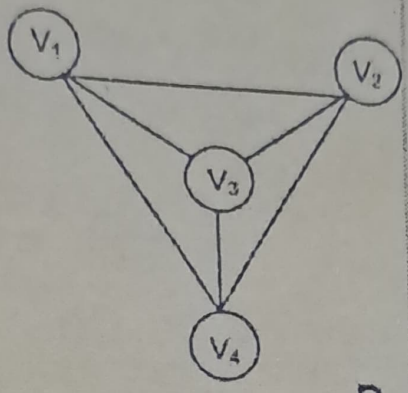
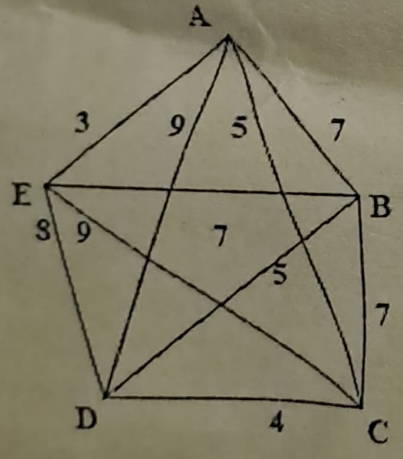
Part – A (10x01 = 10 Marks)
ANSWER ALL QUESTIONS

Q. No	Question	Marks	BL	CO	PO
1	(S,*) is said to be a semi group if a) * is Closed b) * is Closed and Associative c) * is Associative d) it has identity element	1	2	4	1
2	Every sub-group of a cyclic group is a) Homomorphic b) Cyclic c) Isomorphic d) Abelian	1	1	4	1
3	The Hamming distance between the codes x = 010000 and y = 000101 is a) 2 b) 3 c) 4 d) 5	1	1	4	1
4	How many properties can be held by a group? a) 2 b) 3 c) 5 d) 4	1	2	4	1
5	Let G be a group. If a, b $\in$ G then inverse of (a*b) is a) $a^{-1}*b^{-1}$ b) $a*b^{-1}$ c) $a^{-1}*b$ d) $b^{-1}*a^{-1}$	1	1	4	1

6	The maximum number of edges in a simple graph with 6 vertices is a) 40 b) 15 c) 28 d) 8!	1	2	5	1
7	A free (graph) with n vertices has a) n-1 edges b) atleast one loop c) n edges d) no root	1	1	5	1
8	The total number of degrees of an isolated node is _____ a) 0 b) 2 c) 3 d) 1	1	2	5	1
9	K_n denotes__graph a) Regular b) Simple c) Complete d) null	1	2	5	1
10	The chromatic number of the null graph is a) 4 b) 2 c) 3 d) 1	1	1	5	1
	Part – B (4 * 4= 16 Marks) **(Answer 4 out of 5 Questions)**				
11	Prove that $(a * b)^{-1} = b^{-1} * a^{-1}$, for any $a, b \in G$.	4	3	4	1
12	If the permutations of the element of {1,2,3,4,5} are given by $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 5 \end{pmatrix}$, $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 5 & 4 \end{pmatrix}$. Find $\alpha\beta, \beta\alpha, \alpha^{-1}, \beta^{-1}$..	4	2	4	2
13	Write the adjacency matrix of $K_{2,3}$	4	3	5	1
14	Define Euler circuit with example.	4	3	5	1
15	Define spanning tree with example.	4	3	5	1
	Part – C (2 * 12 = 24 Marks)				
16.a	(i) Prove that a subset H of a group (G,*) is a subgroup of G if and only if $a,b \in H \Rightarrow a*b^{-1} \in H$ (ii) Prove that G={1, -1, i, -i} together with ordinary multiplication is group.	12	3	4	2
	[OR]				
16.b	Find the code words generated by the encoding function $e: B^2 \rightarrow B^5$ with respect to the parity check matrix $\begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	6 6	3 3	4 4	2 2

17.a	(i) Show that an undirected graph is a tree if and only if there is a unique simple path between every pairs of vertices. (ii) Determine whether the graphs shown below are isomorphic or not.  A  B	6 6	3 3	5 5	2 2
	[OR]				
17.b	Find the minimum spanning tree for the weighted graph shown below by kruskal's algorithm.  	12	3	5	2