SRM Institute of Science and Technology
College of Engineering and Technology

DEPARTMENT OF MATHEMATICS

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Academic Year: 2022-23 (ODD)

Slot C1

Set A

Test: CLAT-1 **Date: 9.9.2022**
Course Code & Title: 18MAB302T- Discrete Mathematics for Engineers **Duration:** 50 minutes
Year & Sem: III &V **Max. Marks:** 25

Course Articulation Matrix:

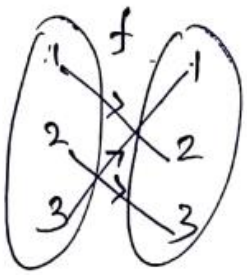
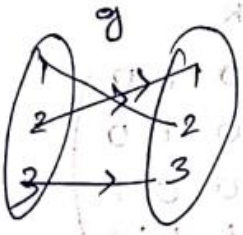
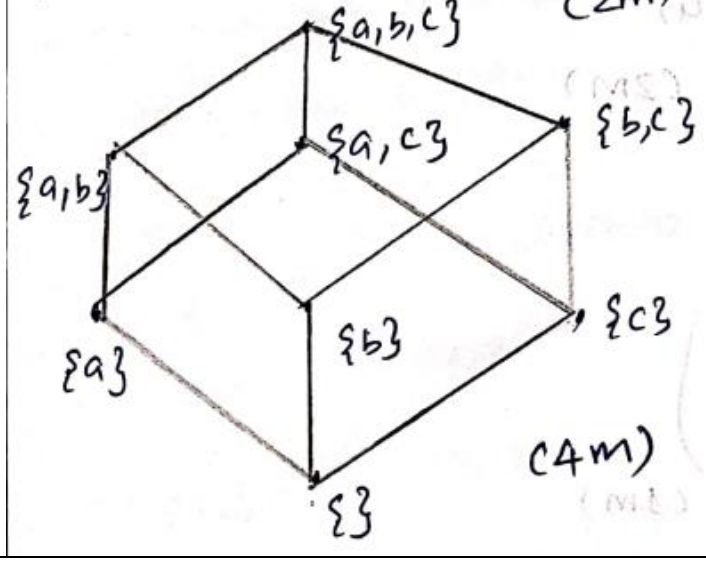
At the end of this course, learners will be able to:			Program Outcomes (PO)											
Course Outcomes (CO)		Learning Bloom's Level	1	2	3	4	5	6	7	8	9	10	11	12
CO1	Apply the concepts of set theory and its operations in data structures and mathematical modeling languages	4	3	3										
CO2	Solve problems using counting techniques and understanding the basics of number theory	4	3	3										
CO3	Comprehend and validate the logical arguments using concepts of inference theory	4	3	3										
CO4	Inculcate the curiosity for applying the concepts of algebraic structures to coding theory	4	3	3										
CO5	Apply graph theory techniques to solve wide variety of real world problems	4	3	3										
CO6	Acquire knowledge in mathematical reasoning, combinatorial analysis and discrete structures	4	3	3										

Part - A
(5 x 1 = 5 Marks)

Instructions: Answer all

Q. No	Answer with choice variable	Marks	BL	CO	PO	PI Code
1	a) $A \cup \phi = A$	1	1	1	2	1.2.1
2	a) Reflexive	1	1	1	2	1.2.1
3	c) $\begin{pmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$	1	2	1	2	1.2.1
4	d) 8	1	2	1	2	1.2.1
5	d) $\{\{1,2,3\},\{4,5\},\{6\}\}$	1	2	1	2	1.2.1

	Part B (2*4= 8 marks)					
6	$\bar{A} \cup \bar{B} \cup (A \cap B \cap \bar{C})$ $= (\overline{A \cap B}) \cup ((A \cap B) \cap \bar{C})$ by De Morgan's law $= ((\overline{A \cap B}) \cup (A \cap B)) \cap (\overline{A \cap B} \cup \bar{C})$ by Distributive law $= U \cap (\overline{A \cap B} \cup \bar{C})$ by Inverse law $= \overline{A \cap B} \cup \bar{C}$ by Identity law $= \bar{A} \cup \bar{B} \cup \bar{C}$ by DeMorgan's law (4m)	4	3	1	2	1.2.1
7	$(a,a) \in R$ as a^2 is a perfect square $\therefore$ R is Reflexive (1m) When ab is a perfect square, ba is also a perfect square. $\therefore$ R is symmetric (1m) Let $aRb \Rightarrow ab = x^2$ & $bRc \Rightarrow bc = y^2$ $\Rightarrow (ab)(bc) = x^2y^2$. $\therefore ac = \left(\frac{xy}{b}\right)^2$ = a perfect square $\therefore$ R is Transitive (1m) Since R is Reflexive, Symmetric and Transitive, R is an equivalence relation (1m)	4	3	1	2	1.2.1

	Part – C **(12 x 1 = 12 Marks)**					
8a	  Both f and g are 1-1 and onto. So f^{-1} and g^{-1} exists (1m) $f^{-1} = \{(2,1)(3,2)(1,3)\}$ (1m) $g^{-1} = \{(2,1)(1,2)(3,3)\}$ (1m) $fog = \{(1,3)(2,2)(3,1)\}$ $(fog)^{-1} = \{(3,1)(2,2)(1,3)\}$ (1m) $f^{-1}og^{-1} = \{(1,1)(2,3),(3,2)\}$ (1m) Hence $(fog)^{-1} \neq f^{-1}og^{-1}$ (1m)	**6**	**4**	**1**	**2**	**1.2.1**
8b	$P(S) = \{\{\}, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{c,a\}, \{a,b,c\}\}$ (2m)  (4m)	**6**	**4**	**1**	**2**	**1.2.1**

9	|A| = 4. compute till W_4 (2 marks) K p_i q_j (p_i, q_j) W_K 1 1,4 1,3 (1,1)(1,3) (4,1)(4,3) $\begin{pmatrix}1&0&1&0\\0&0&1&0\\0&0&0&1\\1&1&1&0\end{pmatrix}$ (2m) 2. 4 3 (4,3) $\begin{pmatrix}1&0&1&0\\0&0&1&0\\0&0&0&1\\1&1&1&0\end{pmatrix}$ (2M) 3. 1,2,4 4 (1,4)(2,4) (4,4) $\begin{pmatrix}1&0&1&1\\0&0&1&1\\0&0&0&1\\1&1&1&1\end{pmatrix}$ (2m) 4. 1,2,3,4 1,2,3,4 (1,1)(1,2) (1,3)(1,4) (2,1)(2,2)(2,3) (2,4)(3,1)(3,2) (3,3)(3,4)(4,1) (4,2)(4,3)(4,4) $\begin{pmatrix}1&1&1&1\\1&1&1&1\\1&1&1&1\\1&1&1&1\end{pmatrix}$ (2m) Transitive closure $R^{\infty} = \{(1,1)(1,2)(1,3)(1,4)(2,1)(2,2)$ $(2,3)(2,4)(3,1)(3,2)(3,3)(3,4)$ $(4,1)(4,2)(4,3),(4,4)\}$ (2M)	12	4	1	2	1.2.1

Question Paper Setter

Approved by Audit Professor/ Course Coordinator