SRM INSTITUTE OF SCIENCE & TECHNOLOGY (Deemed to be University u/s 3 of UGC Act, 1956)

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 B

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)

Q. No	Answer with choice variable	Marks	BL	CO	PO	PI Code
1	a) Inverse law	1	1	1	2	1.2.1
2	d) 2^{mn}	1	1	1	2	1.2.1
3	c) $(A\cap B)\cup(A\cap U)=A$	1	2	1	2	1.2.1
4	d) $\{\{1,2\},\{3,4\},\{5\}\}$	1	2	1	2	1.2.1
5	d) 16	1	2	1	2	1.2.1

Part B
(2*4= 8 marks)

Q. No	Answer	Marks	BL	CO	PO	PI Code
6	$M_{R\cup S}=\begin{pmatrix}1&0&1\\1&1&1\\1&1&0\end{pmatrix}$ (1m) $M_{R\cap S}=\begin{pmatrix}1&0&1\\0&0&0\\0&0&0\end{pmatrix}$ (1m) $M_{R^{-1}}=\begin{pmatrix}1&0&1\\0&1&0\\1&1&0\end{pmatrix}$ (1m) $M_{R'}=\begin{pmatrix}0&1&0\\1&0&0\\0&1&1\end{pmatrix}$ (1m)	4	3	1	2	1.2.1

7	For all $a \in A$, $(a,a) \in R$ $\therefore$ R is Reflexive (1m) If $(a,b) \in R$ then $(b,a) \in R$ $\therefore$ R is symmetric (1m) $(2,3) \in R$ and $(3,1) \in R$ But $(2,1) \notin R$ $\therefore$ R is Not Transitive (1m) So R is Not an equivalence Relation (1m)	4	3	1	2	1.2.1
Part – C **(1 x 12 = 12 Marks)**						
8a	If $f(x_1)$ & $f(x_2)$ are both odd then $2x_1 - 1 = 2x_2 - 1 \Rightarrow x_1 = x_2$ If $f(x_1)$ & $f(x_2)$ are both even the $-2x_1 = -2x_2 \Rightarrow x_1 = x_2$ $\therefore$ $f(x)$ is one-one (2m) Let $y \in N$. If y is odd then its preimage is $\frac{y+1}{2} \in Z$ and if y is even the its preimage is $-\frac{y}{2} \in Z$. $\therefore$ f is Onto as for every $y \in N$ there is a $x \in Z$ (2m) $f^{-1}(x) = \begin{cases} \frac{x+1}{2} & \text{for } x = 1,3,5\ldots \\ -\frac{x}{2} & \text{for } x = 0,2,4,6\ldots \end{cases}$ (2M)	6	4	1	2	1.2.1

<table>
<tr><td>8b</td><td>$R = \{(0,0)(0,2)(0,5)(0,10)(0,11)$
$(0,15)(2,2)(2,5)(2,10)(2,11)(2,15)$
$(5,5)(5,10)(5,11)(5,15)(10,10)(10,11)$
$(10,15)(11,11)(11,15)(15,15)\}$ (1m)
For all $a \in A$, $(a,a) \in R$.
$\therefore R$ is Reflexive (1m)
For $(a,b) \in R$ and $(b,a) \in R$
$\Rightarrow a = b$ $\therefore$ R is Antisymmetric (1m)
If $(a,b) \in R$ and $(b,c) \in R$
$\Rightarrow (a,c) \in R$ $\therefore$ R is Transitive (1m)
$\therefore$ R is a Partial Order Relation (1m)
Hasse Diagram (1m)
• 15
• 11
• 10
• 5
• 2
• 0</td><td>6</td><td>4</td><td>1</td><td>2</td><td>1.2.1</td></tr>
<tr><td>9</td><td>$|A| = 4$. compute till W_4 (2m)
<table>
<tr><td>k</td><td>P_i</td><td>q_j</td><td>(P_i, q_j)</td><td>W_k</td></tr>
<tr><td>1</td><td>1,4</td><td>1,3,4</td><td>(1,1)(1,3)
(1,4)(4,1)
(4,3)(4,4)</td><td>$\begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 \end{pmatrix}$ (2m)</td></tr>
<tr><td>2.</td><td>2</td><td>2</td><td>(2,2)</td><td>$\begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 \end{pmatrix}$ (2m)</td></tr>
<tr><td>3.</td><td>1,4)</td><td>4</td><td>(1,4)(4,4)</td><td>$\begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 \end{pmatrix}$ (2M)</td></tr>
<tr><td>4.</td><td>1,3,4</td><td>1,3,4</td><td>(1,1)(1,3)(1,4)
(3,1)(3,3)(3,4)
(4,1)(4,3)(4,4)</td><td>$\begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \end{pmatrix}$ (2m)</td></tr>
</table>
$R^{\infty} = \{(1,1)(1,3)(1,4)(2,2)(3,1)(3,3)$
$(3,4)(4,1)(4,3)(4,4)\}$ (2m)</td><td>12</td><td>4</td><td>1</td><td>2</td><td>1.2.1</td></tr>
</table>

Question Paper Setter **Approved by Course Coordinator**