

Semester: August 2021 – December 2021 Examination: ESE Examination		
Programme code: 01 Programme: B.TECH	Class: SY	Semester: III(SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the Department COMP	
Course Code: 116U01C305	Name of the Course: Discrete Mathematics	
Duration : 1 Hour 45 Minutes (15 minutes extra for uploading )	Maximum Marks : 50	
Instructions: 1)Draw neat diagrams 2) Assume suitable data if necessary		

Question No.		Max Marks
Q1 (A)	<p>Solve the following Objective questions.</p> <p>1) What is the Cartesian product of <math>A = \{1, 2\}</math> and <math>B = \{a, b\}</math>?</p> <p>a) <math>\{(1,a), (1,b), (2,a), (b,b)\}</math>  b) <math>\{(1, 1), (2, 2), (a, a), (b, b)\}</math>  c) <math>\{(1, a), (2, a), (1, b), (2, b)\}</math>  d) <math>\{(1, 1), (a, a), (2, a), (1, b)\}</math></p> <p>2) What is the cardinality of the set of odd positive integers less than 10.</p> <p>a) 10  b) 5  c) 3  d) 20</p> <p>3) The set of positive integers is _____</p> <p>a) Infinite  b) Finite  c) Subset  d) Empty</p> <p>4) What is the Cardinality of the Power set of the set <math>\{0, 1, 2\}</math>?</p> <p>a) 8  b) 6  c) 7  d) 9</p> <p>5) Let P and Q be statements, then <math>P \leftrightarrow Q</math> is logically equivalent to _____</p> <p>a) <math>P \leftrightarrow \sim Q</math>  b) <math>\sim P \leftrightarrow Q</math>  c) <math>\sim P \leftrightarrow \sim Q</math>  d) None of the mentioned</p>	10

	<p>6) A function is said to be _____ if and only if <math>f(a) = f(b)</math> implies that <math>a = b</math> for all <math>a</math> and <math>b</math> in the domain of <math>f</math>.</p> <p>a) One-to-many b) One-to-one c) Many-to-many d) Many-to-one</p> <p>7) The function <math>f(x)=x+1</math> from the set of integers to itself is onto. Is it True or False? a) True b) False</p> <p>8) Let <math>f</math> and <math>g</math> be the function from the set of integers to itself, defined by <math>f(x) = 2x + 1</math> and <math>g(x) = 3x + 4</math>. Then the composition of <math>f</math> and <math>g</math> is _____ a) <math>6x + 9</math> b) <math>6x + 7</math> c) <math>6x + 6</math> d) <math>6x + 8</math></p> <p>9) For a symmetric digraph, the adjacency matrix is a) Asymmetric b) Symmetric c) Antisymmetric d) asymmetric and antisymmetric</p> <p>10) A normal form contains all minterms , is called  a) a contradiction b) a contingency c) a tautology d) both a and b.</p>	
Q1 (B)	<p>Attempt any FIVE questions out of the following (any 5 out of 7)</p> <p>1) Show that if any five numbers are chosen from 1 to 8, then two of them will add upto 9.</p> <p>2) What are the different conditions for Euler path to exist, Justify with example.</p> <p>3) What are the different conditions for Euler circuit to exist. Justify with example.</p> <p>4) Consider the Hasse Diagram of a set <math>A = \{1,2,3,4\}</math> with <math>R</math> is defined as <math>aRb</math> iff <math>a b</math> ( <math>a</math> divides <math>b</math> ).Is it Lattice? Justify.</p> <p>5) Represent partitions of set with diagram. Justify with mathematical equations.</p> <p>6) Give an example of equivalence relation with justification.</p> <p>7) Write down the relation which is asymmetric, and transitive. Justify with suitable example.</p>	10
Q. 2	<p>Draw the Hasse Diagram of a set <math>A = \{1,2,3,4,6,9,12,18,36,72\}</math> with <math>R</math> is defined as <math>aRb</math> iff <math>a b</math> ( <math>a</math> divides <math>b</math> ).Is it Lattice ? If yes, Is it bounded lattice?</p>	10

	Consider the subset $B = \{4,6,18\}$ . Find maximal and minimal points w r to subset B.	
Q. 3	<p>Let <math>A=\{a,b,c,d,e\}</math> and <math>R=\{(a,a),(a,b),(b,c),(c,e),(c,d),(d,e)\}</math></p> <p>(i) Compute <math>R^2</math>, <math>MR^2</math>, draw digraph.</p> <p>(ii) Compute <math>R^3</math>, <math>MR^3</math>, draw digraph.</p> <p>(iii) Find connectivity Relation with Warshall's algorithm.</p>	10
	<b>OR</b>	
Q. 3	<p>(i) Prove by Mathematical Induction for all <math>n \geq 1</math></p> $1/1.4 + 1/4.7 + 1/7.10 + \dots + 1/(3n-2)(3n+1) = n/3n+1$ <p>(ii) Determine whether following statement is a tautology or not?</p> $[(X \rightarrow Y) \wedge \sim Y] \rightarrow \sim X$	10
Q. 4	<p>Solve the following.</p> <p>(A). Prove that <math>z_4</math> (elements are 0,1,2,3) is an Abelian group under the addition modulo 4 operation.</p> <p>(B). solve any one out of the following.</p> <p>(i) Draw Planer graph with 5 nodes, and 8 edges.</p> <p>(ii) Let</p> $H = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ <p>Be a parity check matrix, determine (2,5) encoding function</p> $e_H : B^2 \rightarrow B^5.$	10 (5+5)