Semester: August 2021 - November 2021				
Examination: In Semester Examination				
Programme code: **Programme: B.Tech. Computer Engineering**		**Class:**SY	**Semester:** III **(SVU 2020)**	
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the department/Section/Center:** COMP		
Course Code: 116U01C305	**Name of the Course:** Discrete Mathematics			

Question No.		Max. Marks
Q1	Multiple Choice Questions: 1. The proposition ~p ∨ (p ∨ q) is a A) Tautology B) Contradiction C) Logical equivalence D) None of the above

2.   Translate ∀x∃y(x < y) in English, considering domain as a real number for both the variable. A) For all real number x there exists a real number y such that x is less than y B) For every real number y there exists a real number x such that x is less than y C) For some real number x there exists a real number y such that x is less than y D) For each and every real number x and y such that x is less than y

3.   The binary relation {(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)} on the set {1, 2, 3} is _____ a) reflective, symmetric and transitive b) irreflexive, symmetric and transitive c) neither reflective, nor irreflexive but transitive d) irreflexive and antisymmetric

4.   The Cartesian Product B x A is equal to the Cartesian product A x B. A) True B) False

5.   The members of the set S = {x | x is the square of an integer and x < 100} is _____ A) {0, 2, 4, 5, 9, 58, 49, 56, 99, 12} B) {0, 1, 4, 9, 16, 25, 36, 49, 64, 81} C) {1, 4, 9, 16, 25, 36, 64, 81, 85, 99} D) {0, 1, 4, 9, 16, 25, 36, 49, 64, 121} | 10 marks |

	6. The binary relation {(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)} on the set {1, 2, 3} is _____ A) reflective, symmetric and transitive B) irreflexive, symmetric and transitive C) neither reflective, nor irreflexive but transitive D) irreflexive and antisymmetric 7. Consider the relation: R' (x, y) if and only if x, y>0 over the set of non-zero rational numbers,then R' is _____ A) not equivalence relation B) an equivalence relation C) transitive and asymmetry relation D) reflexive and antisymmetric relation 8. Negation of statement (A ∧ B) → (B ∧ C) is _____ A) (A ∧ B) →(~B ∧ ~C) B) ~(A ∧ B) v (B v C) C) ~(A →B) →(~B ∧ C) D) None of the mentioned 9. Let R1 be a relation from A = {1, 3, 5, 7} to B = {2, 4, 6, 8} and R2 be another relation from B to C = {1, 2, 3, 4} as defined below: i. An element a in A is related to an element b in B (under R1) if a * b is divisible by 3. ii. An element a in B is related to an element b in C (under R2) if a * b is even but not divisible by 3. Which is the composite relation R1R2 from A to C? A) R1R2 = {(1, 2), (1, 4), (3, 3), (5, 4), (5,6), (7, 3)} B) Φ C) R1R2 = {(1, 2), (1,6), (3, 2), (3, 4), (5, 4), (7, 2)} D) R1R2 = {(2,2), (3, 2), (3, 4), (5, 1), (5, 3), (7, 1)} 10. If set A and B have 3 and 4 elements respectively then the number of subsets of set (A X B) is? A) 1024 B) 2048 C) 512 D) 4096	
Q.2	Solve **ANY TWO** of the following:	10 marks (or 5+5)
(i)	Prove Following Implications using Laws of Logic:	
	a) ∼(p↔q)≡∼((p→q) ∧ (q→p))	(3 M)
	b) ((p∨ ∼q)∧ (∼p∨ ∼q))∨ q is a tautology	(2 M)
(ii)	Write English Sentences corresponding to following:	

a) $\forall x \exists y \, R(x,y)$
b) $\exists x \forall y \, R(x,y)$
c) $\forall x \, (\sim Q(x))$
d) $\exists y \, (\sim P(y))$
e) $\forall (P(x))$

Where, $P(x)$: x is even

        $Q(x)$: x is prime no.

        $R(x,y)$: $x + y$ is even

(iii)

Show that

$$\frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{2n} > \frac{13}{24} \qquad \forall \, n \geq 2$$

by mathematical induction

Q 3	Solve **ANY TWO** of the following:	5+5
(i)	Let A = {1, 2, 3, 4, 5} and R be the relation defined by a R b if and only if $a < b$. Compute and draw diagraphs of: R, R^2 and R^3.	
(ii)	Let A= {1, 2, 3, 4}	
	R = {(1,1), (1,2), (2,3), (2,4), (3,4), (4,1), (4,2)}	
	S = {(3,1), (4,4), (2,3), (2,4), (1,1), (1,4)}	
	Determine: R o R, S o S, $M_{R \, o \, R}$, $M_{S \, o \, S}$	
(iii)	Let A= {1, 2, 3, 4}	
	R = {(1,1), (1,2), (1,4), (2,4), (3,1), (3,2), (4,2), (4,3), (4,4)}	
	Find transitive closure by using 'Warshall's Algorithm'.	