University of Mumbai

Program: Computer Engineering
Curriculum Scheme: Rev 2019
Examination: SE Semester III
Course Code: CSC302 and Course Name: Discrete Structures and Graph Theory

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	$(p \rightarrow r) \lor (q \rightarrow r)$ is logically equivalent to _________
Option A:	$(p \land q) \lor r$
Option B:	$(p \lor q) \rightarrow r$
Option C:	$(p \land q) \rightarrow r$
Option D:	$(p \rightarrow q) \rightarrow r$
2.	How many five-digit numbers can be made from the digits 1 to 7 if repetition is allowed?
Option A:	16807
Option B:	54629
Option C:	23467
Option D:	32354
3.	Two sets are called disjoint if there ______________ is the empty set.
Option A:	Union
Option B:	Intersection
Option C:	Complement
Option D:	Difference
4.	A sub lattice (say, S) of a lattice(say, L) is a convex sub lattice of L if __________
Option A:	x>=z, where x in S implies z in S, for every element x, y in L
Option B:	x=y and y<=z, where x, y in S implies z in S, for every element x, y, z in L
Option C:	x<=y<=z, where x, y in S implies z in S, for every element x, y, z in L
Option D:	x=y and y>=z, where x, y in S implies z in S, for every element x, y, z in L
5.	The inclusion of ______ sets into R = {{1, 2}, {1, 2, 3}, {1, 3, 5}, {1, 2, 4}, {1, 2, 3, 4, 5}} is necessary and sufficient to make R a complete lattice under the partial order defined by set containment.
Option A:	{1}, {2, 4}
Option B:	{1}
Option C:	{1}, {1, 2, 3}
Option D:	{1}, {1, 3}, {1, 2, 3, 4}, {1, 2, 3, 5}
6.	If A and B are sets and $A \cup B = A \cap B$, then
Option A:	$A = \Phi$
Option B:	$B = \Phi$
Option C:	$A = B$
Option D:	$A \subseteq B$

7.	The compound propositions p and q are called logically equivalent if ________ is a tautology.
Option A:	$p \leftrightarrow q$
Option B:	$p \rightarrow q$
Option C:	$\neg (p \vee q)$
Option D:	$\neg p \vee \neg q$
8.	If every element of a group G is its own inverse, then G is
Option A:	finite
Option B:	infinite
Option C:	cyclic
Option D:	Abelian
9.	Consider the binary relation, A = {(a,b) | b = a – 1 and a, b belong to {1, 2, 3}}. The reflexive transitive closure of A is?
Option A:	{(a,b) | a >= b and a, b belong to {1, 2, 3}}
Option B:	{(a,b) | a > b and a, b belong to {1, 2, 3}}
Option C:	{(a,b) | a <= b and a, b belong to {1, 2, 3}}
Option D:	{(a,b) | a = b and a, b belong to {1, 2, 3}}
10.	Let f and g be the function from the set of integers to itself, defined by f(x) = 2x + 1 and g(x) = 3x + 4. Then the composition of f and g is _____________
Option A:	6x + 7
Option B:	6x + 6
Option C:	6x + 8
Option D:	6x + 9
11.	An algebraic structure __________ is called a semigroup.
Option A:	(P, *)
Option B:	(Q, +, *)
Option C:	(P, +)
Option D:	(+, *)
12.	Solve using warshall's algorithm R={(a,b),(b,a),(b,c)} defined of A where A={a,b,c}
Option A:	{(a,a),(c,c),(b,a),(b,b),(b,c)}
Option B:	{(a,a),(a,b),(a,c),(b,c)}
Option C:	{(a,a),(a,b),(a,c),(b,a),(b,b),(b,c),(c,a),(c,b)}
Option D:	{(a,a),(a,b),(a,c),(b,a),(b,b),(b,c)}
13.	The number of symmetric relations on a set with 15 distinct elements is _______
Option A:	2196
Option B:	250
Option C:	2320
Option D:	278
14.	A cyclic group is always __________
Option A:	abelian group
Option B:	monoid
Option C:	semigroup

Option D:	subgroup
15.	If the longest chain in a partial order is of length l, then the partial order can be written as _____ disjoint antichains.
Option A:	l2
Option B:	l+1
Option C:	l
Option D:	ll
16.	Warshall's Algorithm is used to find ____closure
Option A:	Transitive
Option B:	Symmetric
Option C:	Asymmetric
Option D:	Reflexive
17.	_______ and ________ are the two binary operations defined for lattices.
Option A:	Join, meet
Option B:	Addition, subtraction
Option C:	Union, intersection
Option D:	Multiplication, modulo division
18.	In a group of 300 persons, 160 drink tea and 170 drink coffee, 80 of them drink both, How many persons do not drink either?
Option A:	40
Option B:	45
Option C:	50
Option D:	60
19.	How many properties can be held by a group?
Option A:	2
Option B:	3
Option C:	5
Option D:	4
20.	Suppose S is a finite set with 7 elements. How many elements are there in the largest equivalence relation on S?
Option A:	100
Option B:	56
Option C:	49
Option D:	78

Q2 **(20 Marks Each)**	
A	**Solve any Two Questions out of Three** **10 marks each**
i.	How many four digits can be formed out of digits 1,2,3,5,7,8,9 if no digits repeated twice? How many of these will be greater than 3000?
ii.	Let A={1,2,3,4,5} and let R={(1,1),(1,3),(1,4),(2,2),(2,5),(3,1),(3,3),(3,4),(4,1),(4,3),(4,4),(5,2),(5,5)}.

	Check if R is a equivalence relation. Justify your answer. Find equivalence classes of A.
iii.	What is the solution of the recurrence relation $a_n = -a_{n-1} + 4a_{n-2} + 4a_{n-3}$ with $a_0=8$, $a_1=6$ and $a_2=26$?

Q3. **(20 Marks Each)**	
A	**Solve any Two Questions out of Three** **10 marks each**
i.	Find the number of positive integers not exceeding 100 that are not divisible by 5 or 7. Also draw corresponding Venn diagram.
ii.	A travel company surveyed its travelers, to learn how much of their travel is taken with an Airplane, a Train or a car. The following data is known; make a complete Venn Diagram with all the data. The number of people who flew was 1307. The number of people who both flew and used a train was 602. The people who used all three were 398 in number. Those who flew but didn't drive came to total 599. Those who drove but did not use train totaled 1097. There were 610 people who used both trains and cars. The number of people who used either a car or train or both was 2050. Lastly, 421 people used none of these .Find out how many people drove but used neither a train nor an airplane, and also, how many people were in the entire survey.
iii.	Prove that set G={1,2,3,4,5,6} is a finite abelian group of order 6 w.r.t multiplication module 7.