University of Mumbai

Program: Computer Engineering/ AIML/DE
Curriculum Scheme: Rev2019
Examination: SE Semester III
Course Code: CSC302 and Course Name: Discrete Structures and Graph Theory

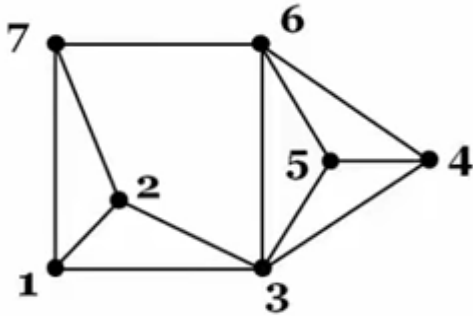Time: 2 hour 30 minutes   Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Let A= {2,3,4,5,6} and let R1,R2 be relations on A such that R1={(a,b) | a-b=2 } and R2={(a,b)| a+1=b or a=2b} Find the composite relation R2.R1?
Option A:	{(4,3),(5,4),(6,2),(6,5)}
Option B:	{(3,2),(5,4),(4,3)}
Option C:	{(5,2),(6,3)}
Option D:	{(2,3),(3,4),(4,5),(5,6)}
2.	Which of the following is the correct representation of the sentence "Someone is liked by everyone ".
Option A:	(∃x)(∃y) likes(x,y)
Option B:	(∀x)(∀y) likes(x,y)
Option C:	(∃y)(∀x) likes(x,y)
Option D:	(∀x)(∃y) likes(x,y)
3.	Consider the following subsets of the positive integers N. Which of the following is not closed under multiplication operation?
Option A:	A={0,1}
Option B:	E={1,3,5,....}
Option C:	C={x: x is prime}
Option D:	F={0,1,2}
4.	How many two digits or three digits numbers can be formed using the digits 1,2,3,4,5,6,7,8 and 9 , if no digits are repeated ?
Option A:	210
Option B:	24
Option C:	212
Option D:	252
5.	If every vertex of simple graph has same degree it is called as _____.
Option A:	Bipartite Graph
Option B:	Regular Graph
Option C:	Planner Graph
Option D:	Sub graph

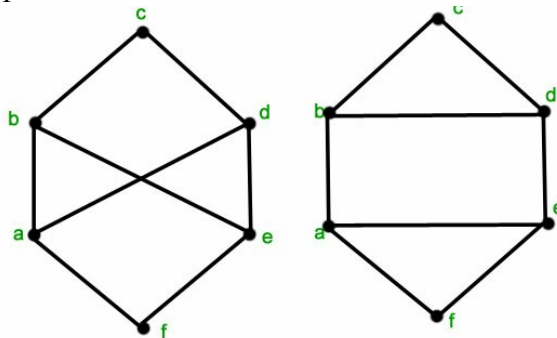|	
6.	Consider set of integers from 1 to 250. Find how many of these numbers are divisible by 5 or 6 but not by 8?
Option A:	83
Option B:	69
Option C:	100
Option D:	31
7.	The set of integers Z with binary operation '*' defined as a*b=a+b+1 for a,b $\in$Z , is a group. The identity element of this group is _____ .
Option A:	0
Option B:	1
Option C:	-1
Option D:	12
8.	A Poset in which every pair of elements has both a least upper bound and a greatest lower bound is termed as _____
Option A:	Walk
Option B:	Trail
Option C:	Sub lattice
Option D:	Lattice
9.	State the type of function for following example " To each country assign the number of people living in the country"
Option A:	Many-One
Option B:	One-Many
Option C:	One-One
Option D:	Many-Many
19.	The binary relation {(a,a), (b,a), (b,b), (b,c), (b,d), (c,a), (c,b)} on the set {a,b,c} is _____
Option A:	irreflexive, symmetric and transitive
Option B:	reflexive, symmetric and transitive
Option C:	irreflexive and antisymmetric
Option D:	neither reflexive, nor irreflexive but transitive

Please use either of the 3 option given below while setting up the subjective/descriptive questions

Option 1

Q2	
A	**Solve any Two** **5 marks each**
i.	Let A={1,2,3,4,5} , R={(a.b)	(a+b) is even}. R is a relation on set A. Check whether R s an equivalence relation?
ii.	X={2,3,6,1,24,36} R on X ={(x,y) $\in$ R, x divides y} a) Construct Hasse diagram

	b) Maximum and Minimal elements? c) Give Chain and Ant chains. d) Maximum length of chain? e) Is a poset lattice?
iii.	Define the following with suitable example a)Ring b) Cyclic Group c) Monoid d)Normal Subgroup e) Planner Graph
B	**Solve any One** **10 marks each**
i.	Define with example Euler path, Euler circuit, Hamiltonian path and Hamiltonian circuit. Determine if following diagram has Euler path, Euler circuit, Hamiltonian path and Hamiltonian circuit and state the path/circuit.
ii.	Find the number of code word generated by the parity check matrix H given below. Find all the code words generated. $$H=\begin{vmatrix} 1\ 1\ 0\ 1\ 0\ 0 \\ 0\ 1\ 1\ 0\ 1\ 0 \\ 1\ 0\ 1\ 0\ 0\ 1 \end{vmatrix}$$

Q3.	
A	**Solve any Two** **5 marks each**
i.	Define Isomorphic Graph. Determine if following graphs G1 and G2 are isomorphic or not.
ii.	Convert into CNF: ((P Q) R)

iii.	Functions f,g,h are defined on a set X={a,b,c} as
	f={(a,b),(b,c),(c,a)}
	g={(a,b),(b,a),(b.b)}
	h={(a,a),(b,b),(c,a)}
	   i) Find fog, gof . Are they equal?
	   ii) Find fogoh and fohog?

B	**Solve any One** **10 marks each**
i.	Prove that (z5,+5) is a Abelian group.
ii.	Solve the recurrence relation for Fibonacci sequence 1,1,2,3,5,8,13.

Q4	
A	**Solve any Two** **5 marks each**
i.	A biased coin tossed till a head appears for the first time. What is the probability that the number of head required is odd?
ii.	Explain the terms wit suitable example (a) Eulerian Graph (b) Hamiltonian Graph.
iii.	If $f(x) = \frac{4x+3}{5x-2}$ find f^{-1}.
B	**Solve any One** **10 marks each**
i.	Prove that the set A={0,1,2,3,4,5} is a finite abelian group under addition modulo 6.
ii.	Let (G,*) be a group. Prove that G is an abelian Group if and only if $(a * b)^2 = a^2 * b^2$