University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

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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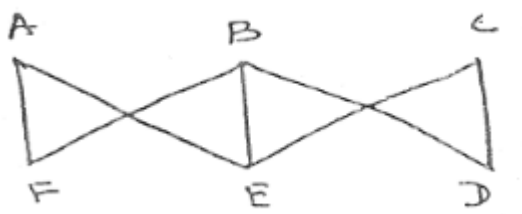
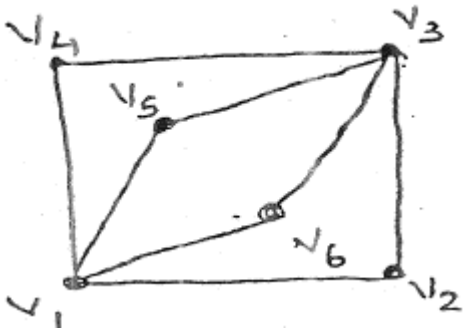
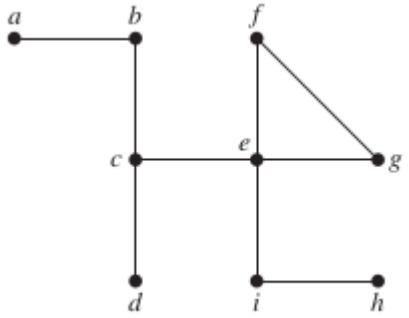
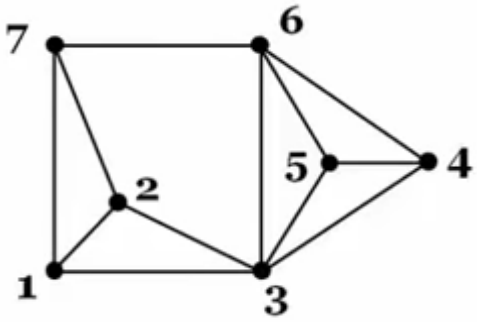
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Let A= {2,3,4,5,6} and let R1,R2 be relations on A such that R1={(a,b) | a-b=2 } and R2={(a,b)| a+1=b or a=2b} Find the composite relation R2.R1?
Option A:	{(4,3),(5,4),(6,2),(6,5)}
Option 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.	Draw the Hasse diagram of D30. i) It is Complemented Lattice ii) It is Distributive Lattice Which of the above statement is True?
Option A:	Only i
Option B:	Only ii
Option C:	Both i and ii
Option D:	Neither i nor ii
4.	Consider the set N of positive integers, and let * denote the operation of least common multiple(lcm) on N. Which of the following sentence is True?
Option A:	(N,*) is not a Semi group.
Option B:	(N,*) is commutative Semi group
Option C:	(N,*) is not commutative Semi group.
Option D:	None of the Above.

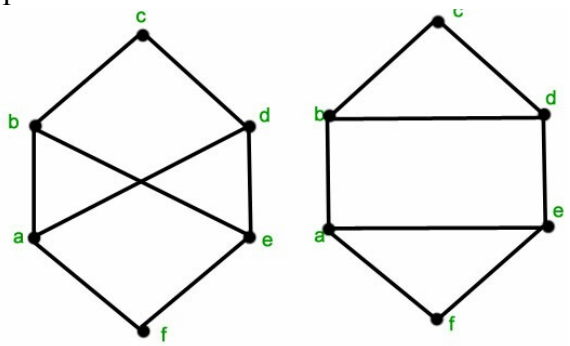
5.	How many two digits or three digits numbers can be formed using the digits 1,2,3,4,5,6,7,8 and 9 , if no digits are repeated ?
Option A:	210
Option B:	24
Option C:	212
Option D:	252
6.	Consider the following subsets of the positive integers N. Which of the following is not closed under multiplication 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}
7.	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
8.	The less than relation,<, on real is
Option A:	A Partial ordering since it is asymmetric and reflexive.
Option B:	A partial ordering since it is anti-symmetric and reflexive.
Option C:	Not a partial ordering because it is not asymmetric and not reflexive.
Option D:	Not a partial ordering because it is not anti-symmetric and not reflexive.
9.	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
10.	Consider G={1,5,7,11,17} under multiplication modulo 18. Find inverse of 5, 7and 17 ?
Option A:	11,17 and 13
Option B:	11,13 and 17
Option C:	11 , 17 and 7
Option D:	13,11 and 7
11.	The following graph is _____. 
Option A:	Bipartite Graph
Option B:	Complete Bipartite Graph

Option C:	Eulerian Graph
Option D:	Eulerian but not Bipartite Graph
12.	The set of integers Z with binary operation '*' defined as a*b=a+b+1 for a,b ∈Z , is a group. The identity element of this group is .
Option A:	0
Option B:	1
Option C:	-1
Option D:	12
13.	How many persons must be chosen in order that at least five of them will have birthdays in the same calendar month?
Option A:	28
Option B:	69
Option C:	49
Option D:	52
14.	 Which of the following is true for above graph? i) It is Eulerian Graph ii) It is Hamiltonian Graph
Option A:	Only i
Option B:	Only ii
Option C:	Both i and ii
Option D:	Neither i nor ii
15.	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
16.	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

17.	Let P: We should be trustworthy. Q: We should be committed. R: We should be overconfident. Then 'We should be trustworthy or committed but not overconfident.' is best represented by?
Option A:	P V Q ∧ R
Option B:	~P V ~Q V R
Option C:	P V Q ∧ ~R
Option D:	P ∧ ~Q ∧ R
18.	Total how many Cut Vertex exists in the following graph? 
Option A:	2
Option B:	4
Option C:	3
Option D:	1
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
20.	Which rule of inference is used in this argument? "No humans can fly. John is human. Therefore John can not fly."
Option A:	Universal instantiation
Option B:	Existential instantiation
Option C:	Universal generalization
Option D:	Existential generalization

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) ∈ 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.	

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	C
Q3.	C
Q4	B
Q5	D
Q6	C
Q7	B
Q8.	D
Q9.	B
Q10.	B
Q11.	A
Q12.	C
Q13.	C
Q14.	A
Q15.	D
Q16.	C
Q17.	C
Q18.	B
Q19.	D
Q20.	A

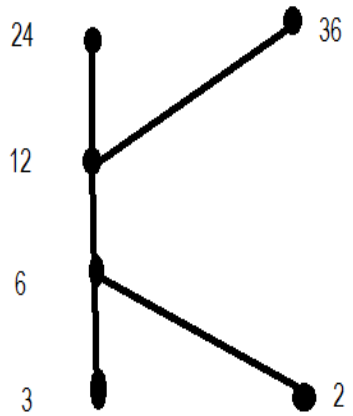
C={(000000),(001011),(010101),(011110),(100111),(101100),(110010),(111001)

Q2. A

i) Definition of Equivalence relation – 1 marks
Prove that relation is equivalence relation – 4 marks

ii)

a. Construct Hasse diagram



b. Maximum elements ={24,36}and Minimal elements={3,2}
c. Chain = {3,6,12,24},{3,6,12,36},{2,6,12,24} and {2,6,12,36}and Ant chains={2,3} and {24,36}
d. Maximum length of chain? 4
e. Is a poset lattice? No
As (2 and 3) has no lower bound and (24,36) has no upper bound

iii) Definition ½ marks and example ½ mark each

B) Solve any one

i) definition1/2 mark example 1 mark 11/2 * 4 = 6 marks for correct path/ circuit finding 4 marks.

ii) Ans :

Q3. I) Defintion with example 2 marks

These are not isomorphic graphs , steps 3 marks.

ii) Convert to CNF , apply logic rules,

and get equivalent form

Ans: (P v R) ^(~Q v R)

iii) Gof= {(1,3),(3,1),(2,2)
, gof ={(1,1),(2,3),(3,2)
Fog not equal to gof
Fogoh ={(1,3),(2,2),(3,3)}
Fohog = {((1,3),(2,2),(3,2)}

B solve any one

i) To prove (Z5, +5) is Abelian group
Definition of Abelian Group – 2 marks, stepwise explanation – 8 marks

ii) Recurrence relation Fibonacci sequence