University of Mumbai

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

Examinations Commencing from 15th June 2021 to 26th June2021

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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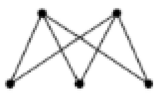
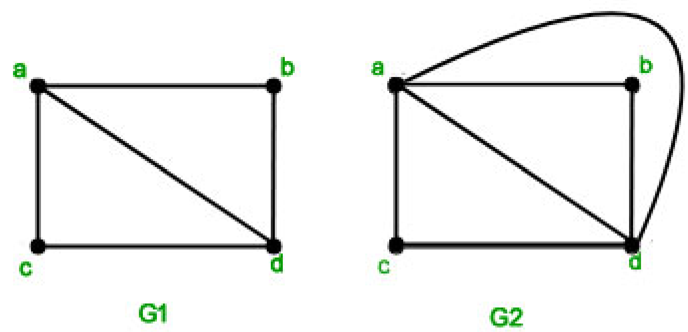
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.**
1.	In a class of 50 students , 20 students play cricket and 16 students play football. It is found that 10 students play both the games. Find out the number of students who play neither of the games.
Option A:	42
Option B:	24
Option C:	12
Option D:	14
2.	Let A={1,2,3,4,5,6,7,8} . Let xRy whenever y is divisible by x, so R is a _____________
Option A:	Equivalence Relation
Option B:	Partial Order Relation
Option C:	Symmetric
Option D:	Neither Equivalence Nor Partial Order Relation
3.	(p^p)^(p (q^q)) is equivalent to ________________.
Option A:	p q
Option B:	q p
Option C:	p^q
Option D:	None of the above
4.	If f and g are onto then function (gof) is ?
Option A:	one to one
Option B:	one to many
Option C:	into
Option D:	onto
5.	Consider P : Food is good , Q: Service is good , R: Restaurant is 5-star. Write the symbolic notation of the statement " It is not true that 5 star rating always means good food and good service"
Option A:	(P ^ Q)--> R
Option B:	~(R →(P ^Q))
Option C:	R → ~(P ^ Q)
Option D:	P^~Q

6.	A is a semigroup (A,*) that has an identity element.
Option A:	Cyclic group
Option B:	Lattice
Option C:	Poset
Option D:	Monoid
7.	A graph having all vertices with equal degree is known as .
Option A:	Regular Graph
Option B:	Euler Graph
Option C:	Simple Graph
Option D:	Hamiltonian Graph
8.	Which of the following is a Tautology?
Option A:	(~p v p) ^ q
Option B:	(p v q) → (p → q)
Option C:	((p v q)^ ~p) → q
Option D:	(~p v ~q) → (p → q)
9.	A graph has an Euler circuit if
Option A:	it is connected and has an even number of vertices.
Option B:	it is connected and has an even number of edges.
Option C:	it is connected and every vertex has an odd degree.
Option D:	every vertex has even degree
10.	Let f and g be the function from the set of integers to itself, defined by f(x) = 3x + 1 and g(x) = 4x + 4. Then the composition of f and g is
Option A:	12x+4
Option B:	12x+5
Option C:	12x + 13
Option D:	12x+8
11.	k10 is a complete graph on 10 vertices and will have ______________ edges.
Option A:	45
Option B:	54
Option C:	40
Option D:	42
12.	Solution of linear homogenous recurrence relation: $a_n = 3a_{n-1} - 2a_{n-2}$ $with\ a_0 = 1,\ a_1 = 3,\ n \geq 2$
Option A:	$a_n = (-1) + 2^n$
Option B:	$a_n = (-1) + 3.2^n$
Option C:	$a_n = (-1)(-1)^n + 2^n$
Option D:	$a_n = (-1) + 2.2^n$
13.	Let A be a finite set of size n, the number of elements in the power set of A is

Option A:	2^{n}
Option B:	n^{2}
Option C:	$(2n)^2$
Option D:	2^{2n}
14.	The transitive closure of the relation R={(a,b),(b,c),(c,d)(e,d)} on set A={a,b,c,d,e} is
Option A:	{(a,b),(b,c),(c,d),(e,d),(a,c)}
Option B:	{(a,b),(b,c),(c,d),(e,d),(a,c),(a,d),(b,d)}
Option C:	{(a,b),(b,c),(c,d),(e,d),(a,c),(a,d)}
Option D:	{(a,b),(b,c),(c,d),(d,e),(a,c),(a,d)}
15.	What is the correct translation of the following statement into mathematical logic? “Some real numbers are rational”
Option A:	∃ x(real(x) v rational(x))
Option B:	∃ x(real(x) ^ rational(x))
Option C:	∀ x (real(x) → rational(x))
Option D:	∃ x(rational(x) → real(x))
16.	The minimum number of edges in a connected graph with n vertices is ______.
Option A:	n-1
Option B:	n
Option C:	n+1
Option D:	n+2
17.	The following graph is _______________________. 
Option A:	Bipartite Graph
Option B:	Complete Bipartite Graph
Option C:	Mixed Graph
Option D:	Simple Graph
18.	What is the minimum number of students required in a class to be sure that at least 6 will receive the same grade , if there are five possible grades A,B,C,D and E.
Option A:	62
Option B:	66
Option C:	26
Option D:	22
19.	Which of the following four subset of integers N is not closed under the operation of multiplication.
Option A:	A={0,1}
Option B:	F={2,4,6,….}

Option C:	B={1,2}
Option D:	E={1,3,5,…..}
20.	The ______________ between two words is the number of differences between corresponding bits.
Option A:	Hamming code
Option B:	Hamming distance
Option C:	Hamming rule
Option D:	Hamming parity checks

Q2. **(20 Marks)**	**Solve any Four questions out of Six.** **5 marks each**
A	Find the CNF form of $(\sim a \rightarrow b) \wedge (a \leftrightarrow b)$
B	Define the following with example 1.Ring 2. Bipartite Graph 3.Chain 4.Semigroup 5. Sublattice
C	Define Euler Path and Euler Circuit. Check whether Euler Path , Euler Circuit exist in the following graphs. 
D	Consider G={1,2,3,4,5,6} under the multiplication modulo 7. i) Find multiplication table of G ii)Find 2^{-1},3^{-1},6^{-1} iii) Is G cyclic?
E	Prove using Mathematical Induction that n^3+2n is divisible by 3 for all n >=1
F	Define and give examples of injective surjective and bijective functions. Check the injectivity and surjectivity of the following function f : N N given by $f(x)=x^3$

Q3. **(20 Marks)**	**Solve any Two Questions out of Three .** **10 marks each**
A	Let D60 be the poset consisting of all the positive divisors of 60 under the partial order of divisibility.

	(a) Write down the elements of D60? (b) Draw the Hasse Diagram of D60. (c) Define Lattice. Is D60 a lattice? Give a reason for your answer
B	Define Isomorphic Graph. Draw K6 and K3,3 graphs . Find whether they are Isomorphic or not?
C	Let A= {a,b,c,d} and let R={(a,a),(a,b),(a,c),(b,a),(b,b),(c,a),(b,c),(c,b),(c,c),(d,d) }. Show that R is a equivalence relation and determine the equivalence classes and find the rank of R.

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

Q. 2 A) Define CNF form **1mark**

Derivation Steps 4 marks

Ans: (a V b) ^(~a v b) ^ (~b v a)

B)

For each correct definition 1 mark 5marks

C)

Define a Euler Path 1 mark

Define Euler Circuit. 1 mark

G1 has two vertices of odd degree and and the rest of them have even degree. So this graph has an Euler path but not an Euler circuit. The path starts and ends at the vertices of odd degree. The path is- a,c,d,a,b,d.

G2 has four vertices all of even degree, so it has a Euler circuit. The circuit is –a,d,b,a,c,d,a .

3 marks

D) Multiplication table of G 2 marks

$\times_7$	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	1	3	5
3	3	6	2	5	1	4
4	4	1	5	2	6	3
5	5	3	1	6	4	2
6	6	5	4	3	2	1

inverse of 2^{-1} is 4 ,3^{-1} is 5 ,6^{-1} is 6 2 mark

G is cyclic 1 mark

E) Define MI 1 mark

Correct proof 4 marks

F) Definition with example 3 marks

example is injective not surjective 2 marks

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Q. 3 A)

a) Elements of D60 2 marks

b) correct Haase diagram 3 mark each

c) Lattice Definition 2 mark

Reason for lattice 3 marks

B) Define Isomorphic graph 2 marks

Draw K6 . 3 marks

Draw K3,3 3 marks

(graphs are not isomorphic) 2 mark

C)

Definition of Equivalence relation 2 marks

Show that R is Equivalence 3 marks

Find equivalence classes 3 marks

[a]= {a,b,c} [b]={a,b,c} [c]={c,a,b} [d]={d}

Find rank of R - Rank definition 1 mark

Rank of R is 2 1 mark