WALCHAND COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Visharambag, Sangli – 416415
Second Year B.Tech. Computer Science and Engineering
ESE , ODD SEMESTER, AY 2022-23
Discrete Mathematics (6CS201)

ESE

PRN: _____

Day & Date: Monday, 30/01/2023   Time : 10.00 am to 1.00 noon

Max Marks: 50

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions   a) All questions are compulsory.
b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
c) Assume suitable data wherever necessary.
d) Figures to the right of question text indicate full marks.
e) Mobile phones, smart gadgets and programmable calculators are strictly prohibited.
f) Except PRN anything else writing on question paper is not allowed.
g) Exchange/Sharing of stationery, calculator etc. not allowed.
h) Solve all the questions showing proper steps to the answer.

Text on the right of marks indicates course outcomes (Only for faculty use)

			Marks	
Q1	A)	Using laws of Logic, prove the following logical equivalence:	5	CO1

1. $(P \wedge Q) \vee (\sim P \wedge Q) \vee (\sim Q \wedge R) \equiv Q \vee R$
2. $(P \leftrightarrow Q) \equiv \sim (P \wedge \sim Q) \wedge \sim (Q \wedge \sim P)$

B) Consider the following set A and relations defined on it. Justify which of these relation are reflexive, symmetric, antisymmetric and/or transitive? A={ 1,2,3,4}   **CO1**

R1={ (1,1),(1,2),(2,1),(2,2),(3,4),(4,1),(4,4)}

R2={ (1,1),(1,2),(2,1)}

R3={ (1,1),(1,2),(1,4),(2,1),(2,2),(3,3),(4,1),(4,4)}

R4={ (2,1), (3,1), (3,2) ,(4,1), (4,2), (4,3)}

R5={ (1,1), (1,2) ,(1,3), (1,4), (2,2) ,(2,3),(2,4),(3,3), (3,4) ,(4,4)}

5

C) Represent the following using Venn diagram: **CO2**

1. $(A \cap B)'$
2. $A' \cup B'$
3. $B \cup C$, if 3 sets are given as A, B, C
4. $A \oplus B$
5. $(A \cap B) \cup (A \cap C)$

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D) Form the negations of the following statements by clearly showing all the steps along with the laws used.   **CO2**

i. $(p \wedge q) \to (\sim p \vee r)$
ii. $(q \vee \sim r) \wedge (p \vee q)$

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Q2 **A)** Define with example of each: **5**
   1. Complete graph
   2. Regular graph
   3. Edge simple path
   4. Bipartite graph   CO2
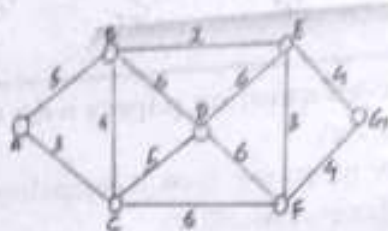   5. In order tree traversal   **4**

B) Prove if the following is group or not:
   1. $\{ 2^n \mid n \text{ is an int}\}, X$
   2. $\{ 0, \pm k, \pm 4k, \pm 8k, \pm 12k, \ldots\ldots \infty\}, +, \quad k \text{ is natural number}$ CO3
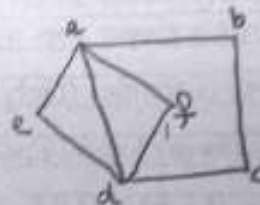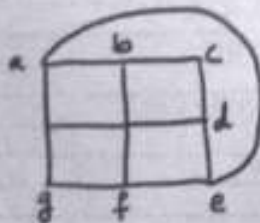
C) Find out the minimum spanning tree by using Kruskal's algorithm and giving step-by-step
solution.

     5

     CO3

D) Find out if the following graph is Euler and/or Hamiltonian. If yes, write down a cycle.
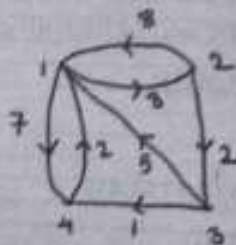Note that only vertices shown in the given graphs are present.

     3

E) Find all pair shortest path in the following graph using Floyed- Warshall algorithm: CO2

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Q3 **A)** Solve the following:
   1. In a sack there are total 10 balls in which 6 are Red and 4 are Black. 2 balls are
      selected from a box, what is the probability that it will be of Red colour?   CO2
   2. From 5 digits : 1,2,3,4,5 -how many 5 digits number can be formed if repetition
      of digit is not allowed?   **3**

B) In class of 100 students, 32 study mathematics, 20 study physics, 45 study biology, 15
study mathematics and biology, 7 study mathematics and physics, 10 study physics and
biology, and 30 do not study any of the three subjects.   CO3
   1. Find number of students studying all 3 subjects?
   2. Find number of students studying exactly one of the three subjects.   **5**