Enrolment No: E22CSEU0820 Name of Student: MADHAV GUPTA

Department/ School: BTECH CSE

END TERM EXAMINATION EVEN SEMESTER 2022-23

COURSE CODE	CSET106	MAX. DURATION	2 HR 30 MIN
COURSE TITLE	Discrete Mathematical Structures		
COURSE CREDIT	4	TOTAL MARKS	50

GENERAL INSTRUCTIONS: -

1. Attempt all the questions. All the questions are compulsory.
2. Do not write anything on the question paper except **name, enrolment number** and **department/school.**
3. Carrying mobile phone, smart watch and any other non-permissible materials in the examination hall is an act of **UFM.**

(1*5)

Q1. Answer the following questions

i. If $6 + 2 = 5$, then the milk is white. Determine the truth value of this statement.

ii. $[p \rightarrow (q \wedge r)] \vee [(p \rightarrow q) \wedge (p \rightarrow r)] \vee 1$. Determine the value of this logical equivalence.

iii. Give an example of a relation which is both symmetric and anti-symmetric.

iv. Find the smallest number of colours you need to properly colour the vertices of $K_{4,5}$ graph.

v. In a word jumble, there are 8 consonants and 5 vowels given. Find out in how many ways can we form a 5-letter word having 3 consonants and 2 vowels?

Q2. Answer the following questions (3)

i. Solve the logical equivalence using the truth table.

$[\neg (p \wedge q)] \rightarrow r$.

ii. Determine whether the following expression is a tautology, a contingency, or a contradiction (3)

$[\neg (A \vee q)] \wedge (A \wedge q)$

iii. For each of these relations on the set {1, 2, 3, 4}, decide whether it is reflexive, irreflexive, symmetric, antisymmetric, asymmetric, and transitive. (5)

a. {(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)}

b. {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)}

c. {(2, 4), (4, 2)}

d. {(1, 1), (2, 2), (3, 3), (4, 4)}

e. {(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)}

iv. Determine the number of edges in a graph with 6 vertices, 2 of degree 4 and 4 of degree 2. Draw two such graphs. (3)

v. If $f(x)=x^2+5$ and $g(x) = x^3-2$. Find *fog(x)* and *gof(x)*. (2)

Q3. Answer the following questions

i. Give a proof by contradiction of the theorem "If 3n+2 is odd, then n is odd." (3)

ii. Let f: Z→Z be the function defined by $f(x)=3x^2+1$. Prove that f(x) is not a bijective function. (3)

iii. Let us assume that R is a relation on the set of integers defined by **aRb** if and only if $a - b$ is an integer. Prove that R is an equivalence relation? (3)

iv. The set L= {1,2,3,4,5,6,12} of factors of 12 under divisibility forms a lattice. Prove it using Hasse diagram. (3)

v. Find the maximum number of edges in a bipartite graph of 12 vertices. Justify your answer. (2)

Q4. Answer the following questions

i. Consider the set $S = \{1, -1, i, -i\}$. If $*$ denotes the multiplication operation then prove that structure $\{S,*\}$ forms a cyclic group. Find the generator/(s) of this set. (4+1)

ii. Determine the GCD of **1288** and **333** using Euclidian algorithm. Express the greatest common divisor of the given pair of integers as a linear combination of these integers. (3+2)

iii. Using Chinese remainder theorem, determine the value of **x**: (5)

$x \equiv 2 \pmod 3$

$x \equiv 1 \pmod 4$

$x \equiv 7 \pmod{11}$