Enrolment No: ______________________ Name of Student: ______________________

Department/ School: ______________________

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.**

Q1. Answer the following questions (1*5)

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

ii. $[p \to (q \wedge r)] \vee [(p \to q) \wedge (p \to r)] \vee 1$. 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

i. Solve the logical equivalence using the truth table. (3)

$[\neg (p \wedge q)] \to r$

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)}

p	q	p→
0	0	1
0	1	1
1	0	0
1	1	1

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)

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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)

Check with i +

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≡2(mod3) $m_1 = 3$

x≡1(mod4) $m_2 = 4$

x≡7(mod11) $m_3 = 11$

$(a_1 M_1 M_1^{-1} + \ldots)$

$M = m_1 \times$

$M_1 = \frac{M}{m_1}$

$\frac{M_1 M_1^{-1} - 1}{m_1}$