(Please write your Enrollment Number) Enrollment No.________________

END TERM EXAMINATION

(December, 2017)

Subject Code: BCS 201	**Subject: Discrete Mathematics**
Time: 3 Hours	**Maximum Marks:** 60
Note: Q1 is compulsory. Attempt one question each from the Units I, II, III & IV.	

Q1. **(2x10=20)**

(a) Prove or disprove, the relation R on the set of all integers $y = x^2$ is reflexive or not. Where $(x,y) \in R$.
(b) How many integers between 1 and 1000000 have the sum of their digits equal to 15?
(c) Define m-ary tree.
(d) Prove by mathematical induction that $n <= 3^n$ for $n \in N$.
(e) Prove that the number of edges in a bipartite graph with n vertices is at most $n^2/4$.
(f) List the properties of lattices.
(g) Write down a truth table to show that ~ (p ˅ q) is equivalent to (~p) ^(~q).
(h) How Dovetailing is used to find the depth of a tree?
(i) Define Bipartite graph.
(j) Prove or disprove that $(p \wedge \bar{q}) \vee (\overline{p \wedge \bar{q}})$ is tautology.

UNIT-I

Q2. **(5,5)**

(a) Solve $y_{k+2} - 16y_k = 0$, if $y0 = 1$ and $y_1 = 2$.
(b) On the set of all 2×2 real matrices, define a relation ¥ by

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} ¥ \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \text{ iff } a_{11}a_{12}a_{21}a_{22} = b_{11}b_{12}b_{21}b_{22}.$$

Determine if this relation is reflexive, symmetric, anti-symmetric, and/or transitive. Justify your answer.

Q3. **(5,5)**

(a) Let R be an equivalence relation on set X, for each a ∈ X, let [a] = {x ∈ X: xRa}, then show that T = {[a]: a ∈ X } is a partition of set X.
(b) Prove or disprove that (X, o) is a group, where X is the set of all square matrices of order n and o is the matrix multiplication operation.

UNIT-II

Q4. **(5,5)**

(a) How many strings of three distinct uppercase letters are there that have no two adjacent letters that are adjacent in the alphabet? (e.g. BIG is correct, but HIT and RED are not.)
(b) Confirm or disprove that the propositional logic $[\{p \to (q \vee r)\} \wedge (\bar{q})] \to (p \to r)$ is a contradiction.

Q5. **(5,5)**

(a) Identify extreme elements in the following Posets:
  i. The divisors of 60, ordered by divisibility.
  ii. The set {a, b, c, d, e, f, g, h}, ordered like the subsets of {0, 1, 2}
(b) Draw the Hasse diagram for the poset of the divisors of 59. Is this poset totally ordered? How does the shape of the diagram relate to the prime factorization of 59? Explain.

UNIT-III

Q6. **(5,5)**

(a) Find a recurrence relation for the number of ways to make a pile of n chips using garnet, gold, red, white and blue chips such that no two gold chips are come together.

P.T.O

(b) Construct the disjunctive normal form of the proposition:

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

Q7. (5,5)

(a) Suppose x is a real number. Consider the statement

If $x^2 = 4$, then $x=2$

Construct the converse, the inverse, and the contrapositive. Determine the truth or falsity of the four statements: the original statement, the converse, the inverse, and the contrapositive.

(b) What is Defuzzification? Explain the rules of defuzzification.

UNIT-IV

Q8. (5,5)

(a) Give an example of a connected graph which has neither Euler circuit and nor Hamiltonian circuit. Under what condition does complete graph K_n has

(i) Euler circuit (ii) Hamiltonian circuit

(b) If G is a connected planar graph with e edges, v vertices and r be the number of regions in a planar representation of G, then prove that $r = e - v + 2$.

Q9. (5,5)

(a) Let δ and Δ denote the minimum and the maximum degrees of the vertices of a graph $G = (V, E)$ with $|V| = p$ and $|E| = q$. Show that $\delta \le 2q/p \le \Delta$

(b) Solve the following LPP using simplex algorithm.

Max $Z = 12x_1 + 6x_2 + 4x_3$

s. t. $4x_1 + 2x_2 + x_3 \le 25$

$2x_1 + 3x_2 + 3x_3 \le 50$

$x_1 + 3x_2 + x_3 \le 45$

$x_1, x_2, x_3 \ge 0$

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END TERM EXAMINATION
(December, 2018)

Subject Code: BCS 201	**Subject:** Discrete Mathematics
Time: 3 Hours	**Maximum Marks:** 60
Note: Attempt all questions internal choice are given.	

Q1.

(a) What is Lagrange's theorem with respect to algebraic system? **(5x4=20)**

(b) Explain

(i) Equivalence class with example.

(ii) Partition of a set with example.

(b) What is "argument"? When it is valid? Explain with example.

(c) What is Ring? When it is called Ring with Zero divisors?

Q2. **(10)**

(a) For any positive integer m, D_m denotes the set of divisors of m ordered by divisibility. Draw the Hasse diagram for m=64 and find out minimum, maximum, first and last element.

(b) Define what is group? Let Z_m denotes the integers modulo m. Find out whether Z_m is group or not under the operation addition & multiplication.

OR

Q3. Write short note on **(10)**

(a) Graph Isomorphism & Homeomorphism

(b) Planner Graph & Bipartite Graph

Q4. **(10)**

(a) What is Lattice? Let C be the collection of sets closed under union and intersection. Find out (C,U,∩) is a lattice or not?

(b) Consider a 9 X 9 sudoku problem and model it using graph coloring problem. What will be the chromatic number for this problem?

OR

Q5. What is fuzzy set? Explain with example, how to find the addition, subtraction and cross product of two fuzzy sets. . Find out α-cut set of the given fuzzy set where α=0.4 and the set is Й={0.7/x + 0.4/y + 0.2/z + 0.1/t + 0.9/u + 1/m + 0.35/w}. **(10)**

Q6. Explain the following **(10)**

(i) Integral Domain and Field

(ii) Normal Fuzzy set

OR

Q7. Define what are conditional, converse, inverse and contrapositive logical statements? What are quatifiers and how they can be used with respect to propositional calculus? Explain all with example. **(10)**

Q8. Explain the following. **(10)**

(i) Bounded Lattice And Complemented Lattice

(ii) Eularian Tour and Hamiltonian tour

OR

Q9. Explain the following. **(10)**

(i) Poset Vs Toset with example

(ii) Binary tree traversal techniques

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End-Term Examination- ONLINE MODE

(CBCS/Non-CBCS)**(SUBJECTIVE TYPE)**

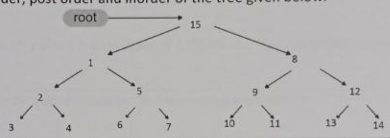
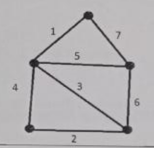
<Programme Name __B.Tech________> <__4___ SEM>

(DEC, 2021)

(SET A)

Subject Code:< BCS 203 >	**Subject: < Discrete Structures >**
Time : 1 Hour 15 minutes	**Maximum Marks :** 30

Note: Q. 1 is compulsory. Attempt any one question from the rest.

Q1		**(5*3=15)**
	(a) Construct the truth table of the compound proposition (p -> ~q)^(~p <-> ~q)	
	(b) Write the preorder, post order and inorder of the tree given below. 	
	(c) Let (Z, *) be an algebraic structure, where Z is the set of integers and the operation * is defined by n * m = maximum of (n, m). Show that (Z, *) is a semi group. Is (Z, *) a monoid ?. Justify your answer.	
Q2		**(7.5+7.5= 15)**
	(a) Are these specifications consistent or not? Justify your answer using logical statements. i. The computer is in working state if and only if it is operating accurately. ii. If the computer is operating accurately, then the kernel is functioning. iii. The kernel is not functioning or the computer is in an interrupt state. iv. If the computer is not in working state, then it is in an interrupt state. v. The computer is not in an interrupt state.	
	(b)Draw all possible spanning trees of Graph G and find the minimal spanning tree and cost of graph G using Kruskal's algorithm. 	
Q3		**(7.5+7.5= 15)**
	(a) Determine whether the set (Z, +, *) with operations +=addition and *=multiplication is a ring or not.	
	(b) Draw the hasse Diagram step by step, representing the partial ordering set A={2,3,6,12,18,36} where aRb=a divides b.	

DISCRETE STRUCTURES (END-TERM)

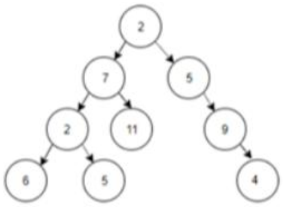
(a)

(I) Find the inverse of the function f: R→ R, where f(x) = x+3

(ii) Use pigeonhole principal to show that in any set of eleven integers, there are two integers whose difference in divisible by 10.

(b) In a pollution study of 1500 rivers, the following data were reported: 520 rivers were polluted because of Sulphur compounds, 335 were polluted by phosphates, 425 were polluted by crude oil, 100 were polluted by Sulphur and phosphates, 150 polluted by both phosphates and crude oil and 28 were polluted by Sulphur compounds, phosphates and crude oil. Using Venn diagram find out how many rivers are not polluted.

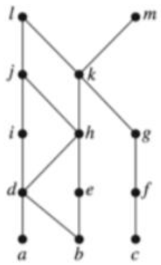
(c) For the tree below, write preorder, in-order and post-order traversal



(a)

(i) Using Mathematical Induction prove that 5^{2n}- 2^{5n} is divisible by 7.

(ii) For the partial order represented by the Hasse diagram find out:



1. Find the maximal elements
2. Find the minimal elements
3. Is there a greatest element?
4. Is there a least element?
5. Find all upper bounds of {a, b, c}
6. Find all least upper bound of {a, b, c}. if it exists.
7. Find all lower bounds of {f, g, j}
8. Find the greatest lower bound of {f, g, h}. if it exists

(b) Find out whether the set F of all real numbers of the type a+ √2b where a and b are rational is a Group under addition and multiplication or not.