DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Summer 2019

Course: B. Tech in CE/ CS / CS&E **Semester: III**

Subject Name: Discrete Mathematics **Subject Code: BTCOC302**

Max. Marks: 60 **Date: 29 / 05 / 2019** **Duration: 3 Hrs.**

Instructions to the Students:

1. *Solve **ANY FIVE** questions out of the following.*
2. *The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/ CO)	Marks
Q.1	**Solve Any Three of the following.**		
A)	Among integers 1 to 1000,	Application	4
	i. How many of them are not divisible by 3 nor by 5 nor by 7?		
	ii. How many are not divisible by 5 or 7 but divisible by 3?		
B)	Among integers 1 to 300,	Application	4
	i. How many of them are not divisible by 3 nor by 5 nor by 7?		
	ii. How many of them are divisible by 3 but not by 5, nor by 7?		
C)	i. Obtain the Conjunctive Normal Form of $(p \wedge q) \vee (\sim p \wedge q \wedge r)$	understand	4
	ii. Obtain the Disjunctive Normal Form of $\sim (p \rightarrow (q \wedge r))$		
D)	Transcribe the following into logical notation. Let the universe of discourse be the real numbers.	understand	4
	i. For any value of x, x^2 is non-negative.		
	ii. For every value of x, there is some value of y such that $x \cdot y = 1$.		
	iii. There are positive values of x and y such that $x \cdot y > 0$.		
	iv. There is a value of x such that if y is positive, then $x + y$ is negative.		
Q.2	**Solve Any Two of the following.**		
A)	$X = \{2, 3, 6, 12, 24, 36\}$ R on $X = \{(x, y) \in R, x \text{ divides } y\}$	Synthesis	6
	(a) Construct Hasse diagram.		
	(b) Find maximal and minimal element?		
	(c) Is poset a lattice? Justify.		
B)	Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relation from A to B:	understand	6

$R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$

(a) Determine the matrix of the relation.

(b) Find the inverse relation R^{-1} of R.

(c) Determine the domain and range of R.

C) Given: $A = \{1, 2, 3, 4\}$. Consider the following relation in A: understand 6

$R = \{(1, 1), (2, 2), (2, 3), (3, 2), (4, 2), (4, 4)\}$

(a) Draw its directed graph.

(b) Is R (i) reflexive, (ii) symmetric, (iii) transitive, or (iv) antisymmetric?

(c) Find $R^2 = R \circ R$.

Q.3 Solve the following.

A) Consider the second-order homogeneous recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with the initial conditions $a_0 = 2$, and $a_1 = 7$. Application 6

(a) Find the next three terms of the sequence.

(b) Find the general solution.

(c) Find the unique solution with the given initial conditions.

B) Solve the following recurrence Understand 6

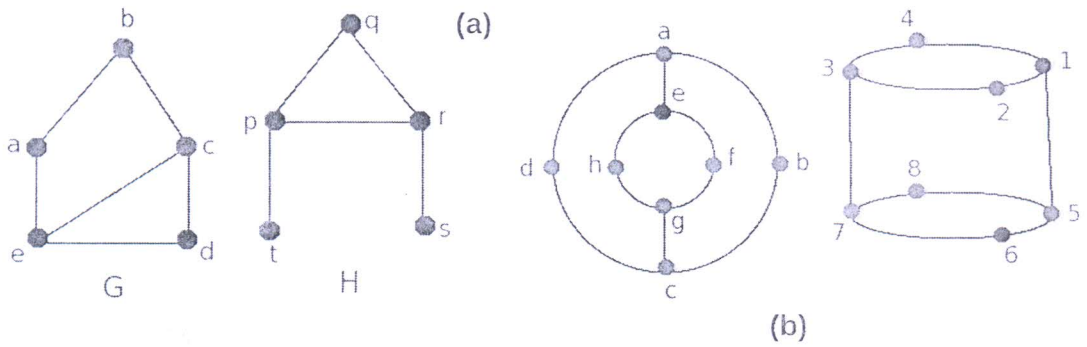
$$t_n = 6t_{n-1} - 11t_{n-2} + 6t_{n-3}$$

with initial conditions

$$t_0 = 1, t_1 = 5, \text{ and } t_2 = 15$$

Q.4 Solve Any Two of the following.

A) Define the isomorphic graph. Are the following graphs shown in fig. (a) and (b) isomorphic? Understand 6



B) (a) Draw the graph $K_{2,5}$. Understand 6

(b) Define the following terms:

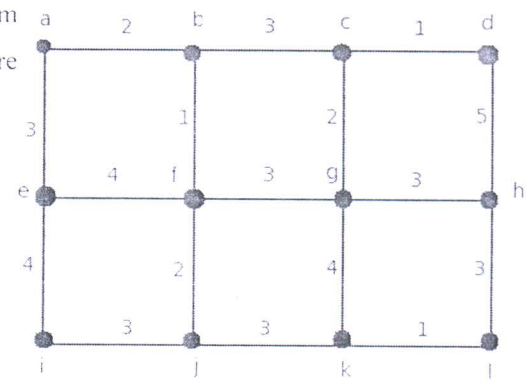
(i) Planar Graph (ii) Bipartite Graph (iii) Complete graph

(c) Draw the 2-regular graph with 5 vertices.

C) Write the Euler's Formula. Prove that in planar graph G with p vertices and q edges, where $p \geq 3$ then $q \geq 3p - 6$. Knowledge 6

Q.5 Solve the following.

A) Use Prim's algorithm to find a minimum spanning tree in the graph shown in Figure given below. Understand 6



B) Construct a Binary Search Tree by inserting the following sequence of numbers: Application 6

10, 12, 5, 4, 20, 8, 7, 15, 13.

Also Find Preorder, Inorder and Postorder traversal of Binary Search Tree.

Q.6 Solve the following.

A) Define the following terminology: Knowledge 6

(i) Identity Element (ii) Monoid (iii) Group (iv) Algebraic System

(v) Ring (vi) Inverse Element

B) Consider the group G = {1, 2, 3, 4, 5, 6} under multiplication modulo 7. Understand 6

(a) Find the multiplication table of G.

(b) Find the 2^{-1}, 3^{-1}, 6^{-1}.

(c) Find the orders and subgroups generated by 2 and 3.

*** End ***