Sr. No. 018402

August/September 2022

B.Tech. IV SEMESTER

Discrete Mathematics (PCC-CS-401)

Time: 3 Hours **Max. Marks:75**

Instructions:

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) If A = {1, 2, 3}, B = {3, 4} and C = {4, 5, 6}, determine the A X (B U C) (1.5)

(b) Find the number of ways that a party of seven persons can arrange themselves around a circular table. (1.5)

(c) In how many ways can a committee consisting of three man and two women be chosen from seven men and five women? (1.5)

(d) Describe the proof by contradiction. (1.5)

(e) Define Normal subgroup. (1.5)

(f) Differentiate between the graph and tree. (1.5)

(g) State the well ordering principle. (1.5)

(h) Prove that sum of degree of all vertices in a graph is equal to twice the number of edges in graph. (1.5)

(i) Describe the articulation points by giving suitable example. (1.5)

(j) What is isomorphism of graph? (1.5)

PART -B

Q2 (a) What are quantifiers? Explain the use of quantifiers by giving suitable examples. (5)

Q2 (b) Define composition of function. If f and g be the functions from the set of integers defined by f(x) = 2x+3 and g(x) = 3x+2. Determine the following (5)

(i) f o g

(ii) g o f

Q2 (c) Let f be the function from {a, b, c, d} to {1, 2, 3, 4} with f(a) = 4, f(b) =2, f(c) =1, and f(d) = 3. Investigate the function f to be bijective. (5)

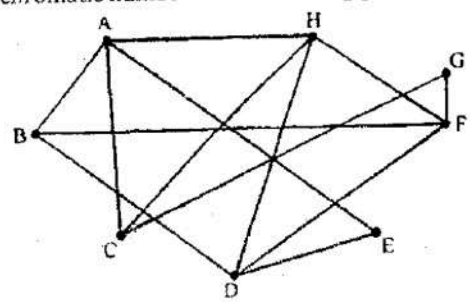
Q3 (a) State the Pigeon hole principle. Find the minimum number of students in a class to be sure that three of them are born in the same month. (5)

Q3 (b) State and prove the Schroeder-Bernstein theorem. (10)

Q4 (a) What is conjunctive normal form. Obtain the Conjunctive normal form (CNF) of the given Boolean function (6)

$$f(x, y, z) = (x+z)(x+y')$$

Q4 (b) What do you mean by the graph coloring and chromatic number of the graph? Determine the chromatic number of the following graph. (9)



Q5 (a) If R is a relation on the set of positive integers I such that $(a, b) \in R$ if only if $a - b \leq 1$. Determine whether the relation R is (8)

i. reflexive
ii. symmetric
iii. transitive
iv. antisymmetric
v. a partial order relation
vi. an equivalence relation

Q5 (b) Write the properties of group in algebraic structure. Prove that the set I of all integers is a group with respect to the operation of addition of integers. (7)

Q6 (a) Explain the Eulerian and Hamiltonian Walks by giving a suitable example. (5)

Q6 (b) Write the Euclidean algorithm for greatest common divisor? By applying the Euclidean algorithm, compute the greatest common divisor (GCD) of 210 and 45. (5)

Q6 (c) Define propositions and its connectives. Show that the $\sim(p \vee q)$ is logically equivalent to $(\sim p) \wedge (\sim q)$. (5)

Q7 Write short note on following (3*5)

(a) weighted trees and prefix codes
(b) integral domain and fields
(c) rules of inference

****