WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 2nd Semester Examination, 2021

CMSACOR04T-COMPUTER SCIENCE (CC4)

DISCRETE STRUCTURES

Time Allotted: 2 Hours   Full Marks: 50

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1.   Answer any *five* questions from the following: 2×5 = 10

   (a) Define power set of a set.

   (b) State DeMorgan's laws in Boolean algebra.

   (c) What is a Hamiltonian Circuit?

   (d) What do you mean by a reflexive relation? Give example.

   (e) Show that a complete graph with *n* vertices has $n(n-1)/2$ edges.

   (f) Find the number of distinct permutations that can be formed from all the letters of word "PROGRAMMING".

   (g) What is chromatic number of a graph?

Answer any *five* questions from the following

2. (a) Define Edge-connectivity and vertex-connectivity of a graph. Give examples.   4+4

   (b) Prove that a connected graph with *n* vertices and $(n-1)$ edges is a tree.

3. (a) Prove that if *n* is an odd number ≤ 3, then in a complete graph with *n* vertices there are $(n-1)/2$ edge-disjoint Hamiltonian circuits.   6+2

   (b) What is space complexity?

4. (a) Solve by the characteristic roots Method: 5+3

   $$a_r - 6a_{r-1} + 8a_{r-2} = 0 \text{, given } a_0 = 4 \text{, } a_1 = 10$$

   (b) If three dice are rolled, find the probability that exactly one face shows a number less than or equal to 4.

5. (a) Define planar graph. Prove that the complete graph of five vertices is non-planar.   2+3+3

   (b) Prove that every tree with two or more vertices is 2-chromatic.

6. (a) Let A and B be two finite sets, then prove that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.   4+4

   (b) Let S be any set of 11 numbers from (1, 2, …, 20). Use pigeon hole principle to show that there are two numbers in S whose sum is equal to 21.

7. (a) By method of induction, prove that $5^n - 4n - 1$ is divisible by 16 for all $n \geq 1$.   5+3

   (b) Find the number of unordered selections of 5 cards from a standard deck of 52 cards such that they contain all the four different suits.

8. (a) Establish the equivalence: $(p \rightarrow q) \wedge (r \rightarrow q) = (p \vee q) \rightarrow q$ 2+3+3

   (b) State and prove the Generalized problem of Pigeon-hole principle.

   (c) There are 100 people in a certain room. In this group, 60 are men, 30 are young and 10 are young men. How many are old woman?

9.   Write short notes on any *two* of the following: 4×2 = 8

   (a) Travelling Salesman Problem

   (b) Cut set and Cut vertex

   (c) Depth First Search.

    N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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