CSC165-2081 ✡

Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (CSC165)
(Discrete Structure)
(NEW COURSE)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

*Candidates are required to give their answers in their own words as for as practicable.
The figures in the margin indicate full marks.*

Section A

Long answer questions.
Attempt any TWO questions.

(2×10=20)

1. List any four rules of inferences. Using direct and indirect proof show that, for any real number x, If $x^3 - 7x^2 + x - 7 = 0$, then x = 7.
   [4 + 3 + 3]

2. What are the necessary and sufficient conditions for graphs to have Euler path only and Euler circuit? Let R be a relation defined on set of natural numbers N, such that a, b ∈ N, $a \, R \, b \Rightarrow \frac{a}{b} = 2^k$, where k ∈ {0, 1, 2, ...}. Show that R is a partial ordering relation on N. [3 + 7]

3. Determine whether the function f(x) = x -1, from set of integers to the set of integers is injective, surjective or bijective. Write the types of fuzzy set operations with their definitions. Give the floor and ceiling value of 1.2 and -1.2.
   [4 + 4 + 2]

Section B

Short answer questions.
Attempt any EIGHT questions.

(8×5=40)

4. Find the GCD of 12 and 16 using Extended Euclidean Algorithm.
   [5]

5. Using mathematical induction show that $2 + 5 + 8 + \cdots + (3n - 1) = \frac{n(3n+1)}{2}$.
   [5]

6. State sum rule and product rule. If 26 integers are chosen from the set of consecutive integers {1, 2, 3, ..., 50}, prove that there are sure to be two numbers so that one is multiple of the other. [2 + 3]

7. Discuss about meet and join operation between Boolean matrixes. What are the values of 5 MOD 7 and -5 MOD 7.
   [3 + 2]

8. Define chromatic number. How does Kruskal's algorithm find Minimum Spanning Tree? [1 + 4]

9. Solve the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with initial conditions with $a_0 = 2$ and $a_1 = 7$. [5]

10. What is network flow? Give an example of saturated edge, unsaturated edge and slack. [2 + 3]

11. When do we use permutation rather than combination? How many 5 digit numbers can be generated using the digits 0 to 9, if each number starts with 98 and no digit appears more than once?
    [5]

12. Define subset and power set. How do you prove correctness of recursive algorithm using Induction? Illustrate with an example.
    [2 + 3]