BANKURA UNIVERSITY

B. Sc. (HONOURS) SECOND SEMESTER EXAMINATIONS, 2021

Subject: Computer Science (Hons) **Course ID: 21512**

Course Title: Discrete Structures

Full Marks: 40 **Time: 2 Hrs**

The figures in the margin indicate full marks

Answer all the questions.

UNIT I

1. Answer *any five* of the following questions: **(5×2 = 10)**

a) Give an example of countably infinite set

b) Distinguish between functions and relations

c) What is closure property?

d) Why is inclusion-exclusion principle used?

e) What do you mean by space complexity?

f) Express factorial computing as a recurrence relation

g) Distinguish between graph and tree

h) What do you mean by the equivalence of two expressions in propositional logic?

UNIT II

2. Answer *any four* of the following questions: **(4×5 = 20)**

a) Describe following properties of binary relations with suitable examples:
Reflexive/irreflexive, symmetric/antisymmetric

b) In a group of 6 boys and 4 girls, 4 children are to be selected. In how many different ways they can be selected such that at least one boy should be there?

c) Using mathematical induction show that 1×2 + 3×4 + 5×6 +…….+ (2n-1)×2n = $\frac{n(n+1)(4n-1)}{3}$

d) Prove that $\sum_{k=0}^{\infty} \frac{k^2}{2^k}$ is O(1)

e) Find a recurrence relation that generates the following series: 1, 5, 17, 53, 161, 485……..

f) Solve the recurrence relation $a_n = 3a_{n-1} + 2, a_0 = 1$

g) What is tautology?
Show that ~ (P V Q) = ~P ∧ ~Q

h) Discuss the following terms in the context of graph theory with suitable examples:
Graph isomorphism, Hamiltonian Paths.

UNIT III

3. Answer *any one* of the following questions: (1×10 = 10)

a) Name some techniques for assessing function growth. Discuss big-Oh and big-Omega notations with suitable examples.

Show that T (n) = 2 T ($\frac{n}{2}$) + n is O (n log n)

b) What do you mean by spanning tree?

Describe an algorithm for determining the minimum spanning tree of a graph with a suitable example.

Establish the relationship between sum of vertex-degrees and number of edges of a graph.