'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 2nd Semester Examination, 2022

CC4-COMPUTER SCIENCE (23)

DISCRETE STRUCTURES

Time Allotted: 2 Hours | Full Marks: 60

The figures in the margin indicate full marks.
All symbols are of usual significance.

GROUP-A

Answer any *four* questions 3×4 = 12

1. Define Pigeonhole principle.

2. What is Eulerian graph? Give example.

3. Find 'n' if $P(n, 2) = 72$.

4. Define one-one and onto function. Give example.

5. What is equivalence relation? Give example.

6. State De Morgan's Law.

GROUP-B

Answer any *four* questions 6×4 = 24

7. Prove that inclusion relation on the set of sets is an equivalence relation.

8. Suppose $f : G \to G'$ is a group homomorphism. Prove that
$f(e) = e'$ and $f(a^{-1}) = f(a)^{-1}$

9. State and prove Euler's formula in connected maps.

10. Prove that intersection of two normal subgroups is a normal subgroup.

11. Explain asymptotic notations with the help of examples.

12. Explain Hamiltonian paths with the help of examples.

GROUP-C

Answer any *two* questions 12×2 = 24

13. Solve the recurrence relation:

$$a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$$

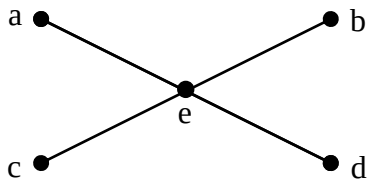
with initial conditions

$$a_0 = 2,\ a_1 = 5,\ a_2 = 15$$

14.(a) Prove that any two cyclic groups of the same order are isomorphic. 6+6 = 12

(b) State and prove the fundamental theorem of isomorphic for groups.

15.(a) Does the graph shown below is Hamiltonian Circuit? 6+6 = 12



(b) Find the generating function of the sequence 1, 2, 3, 4, …

16. Write short notes on the following:

(a) Well-formed formula

(b) Quantifiers.

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