



'সমানো মন্ত্র: সমিতি: সমানী'

**UNIVERSITY OF NORTH BENGAL**  
BCA Honours 3rd Semester Examination, 2022

**CC7-BACHELOR OF COMPUTER APPLICATION (33)**

**DISCRETE STRUCTURES**

Time Allotted: 2 Hours

Full Marks: 60

*The figures in the margin indicate full marks.*

**GROUP-A**

**Answer any four questions**

3×4 = 12

1. Define Domain and Range. Explain the properties of relations. 3
2. Explain pigeonhole principle with example. 3
3. Define the following properties of set:  
Cardinality, Complement, Set Identities. 3
4. What is Eulerian graph? Give example. 3
5. Define one-one and onto function. 3
6. What is equivalence relation? Give example. 3

**GROUP-B**

**Answer any four questions**

6×4 = 24

7. Explain Hamiltonian paths with the help of examples. 6
8. What is permutation? How many distinct words of letter five can be formed from the strings of letters PQRSTUVWXYZ, if it contains a sub-string STUV? 1+5
9. Is  $(p \rightarrow q) \rightarrow [(p \rightarrow q) \rightarrow q]$  a tautology? Why or why not? 6
10. Explain asymptotic notations with the help of example. 6
11. Prove that a planar graph has at most  $2n - 4$  edges if  $n \geq 3$  and it contains no cycle of length three. 6
12. State and prove Euler's formula in connected maps. 6

**GROUP-C**

**Answer any two questions**

12×2 = 24

- 13.(a) State and prove the fundamental theorem of isomorphism for groups. 6+6  
(b) Prove that any two cyclic groups of the same order are isomorphic.
- 14.(a) What is Spanning tree? Differentiate between multigraphs and weighted graphs. 6+6  
(b) Prove that, in a graph  $G = (V, E)$  the number of vertices of odd degree is always even.
15. What is recurrence relation and its types? Solve the Fibonacci numbers recurrence relation  $f_n = f_{n-1} + f_{n-2}$  for  $f_0 = 0$  and  $f_1 = 1$ . 4+8
16. Write short notes on the following: 4+4+4  
(a) Principle of Inclusion and Exclusion  
(b) Hamiltonian Paths and Circuits  
(c) Well-formed Formulas.

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