

**FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2023**  
**(Regular/Improvement/Supplementary)**

**COMPUTER SCIENCE**  
**FCSS1C01 – DISCRETE MATHEMATICAL STRUCTURES**

**Time: 3 Hours**

**Maximum Weightage: 30**

**Section A: Short answer questions. Answer any *four* questions. Each carries *two* weightage.**

1. If  $A = \{4, 5, 7, 9, 10\}$ ,  $B = \{7, 9, 10, 13\}$ , and  $C = \{10, 12, 13\}$ , find  $(A \cap B) \cap (B \cup C)$ .
2. What is ring? Explain briefly its properties.
3. Define inclusion-exclusion principle with example.
4. Enumerate bijective function. Show that the function  $f(x) = 3x-7$  is a bijective function from  $\mathbb{R}$  to  $\mathbb{R}$ .
5. Write the principles of duality.
6. Explain briefly how to find a graph is bipartite.
7. Differentiate between Hamiltonian and Euler graph.

**(4 × 2 = 8 weightage)**

**Section B: Short essay questions. Answer any *four* questions. Each carries *three* weightage.**

8. Translate each of the statement into symbols, using quantifiers, variables and predicate symbols. Let  $P(x)$ :  $x$  can speak Malayalam and  $Q(x)$  :  $x$  knows the language C++.
  - i) There is a student who can speak Malayalam and who knows C++.
  - ii) Every student either can speak Malayalam or knows C++.
  - iii) No student can speak Malayalam or knows C++.
9. Define Equivalence Relation.  
  
Consider  $A = \{2, 3, 4, 5\}$  and  $R = \{(5, 5), (5, 3), (2, 2), (2, 4), (3, 5), (3, 3), (4, 2), (4, 4)\}$ , show that the relation  $R$  is an equivalence relation.
10. Write short note on pigeonhole principle.
11. What is a lattice? Explain its properties.
12. Show that the set  $\{1,2,3,4,5\}$  is not a group under addition and multiplication modulo 6.

**(P.T.O.)**

13. What are homomorphism and isomorphism of a group?
14. Briefly explain about Dijkstra's Shortest Path Algorithm.

**(4 × 3 = 12 weightage)**

**Section C: Essay questions. Answer any *two* questions. Each carries *five* weightage.**

15. a) Explain about conjunctive and disjunctive normal forms. Explain the procedure to obtain a disjunctive normal form of a given logical expression.  
b) Convert the following sentence into conjunctive normal form  $p \wedge (p \rightarrow q)$ .
16. Explain about complement and distributive lattice.
17. a) What is coset?  
b) State and prove Lagrange's theorem.
18. Define minimum spanning tree. Explain Kruskal's algorithm with an example.

**(2 × 5 = 10 weightage)**