

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2024
(Regular/Improvement/Supplementary)

COMPUTER SCIENCE
FCSS1C01 – DISCRETE MATHEMATICAL STRUCTURES

Time: 3 Hours

Maximum Weightage: 30

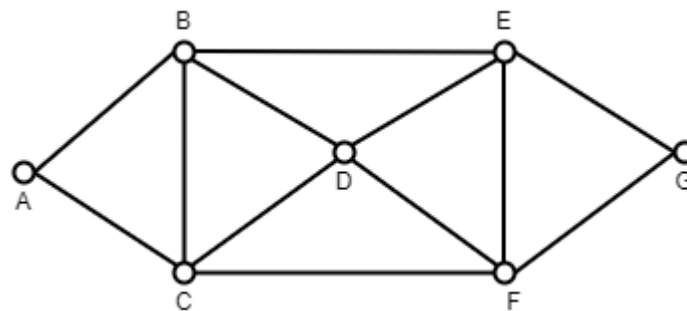
Section A: Short answer questions. Answer any *four* questions. Each carries *two* weightage.

1. State Duality Principle. Write the Dual of $(U \cap A) \cap (\emptyset \cup A^c) = \emptyset$.
2. Let $f(x) = 3x^2 + x - 10$ and $g(x) = 2x - 3$. Find $f \circ g$ and $g \circ f$?
3. Define distributive lattice with an example.
4. Show that $(\mathbb{Z}_6, +_6)$ is a cyclic group.
5. Describe Complete Bipartite Graph. Draw complete Bipartite Graph $K_{2,3}$.
6. Find the inverse of the function $f(x) = \frac{2x+3}{4x+1}$.
7. Let $U = \{x: x \in \mathbb{N} \text{ and } 1 \leq x \leq 10\}$, $A = \{2, 4, 6, 8, 10\}$ and $B = \{3, 6, 9\}$. Show that $(A \cup B)^c = A^c \cap B^c$.

(4 × 2 = 8 weightage)

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

8. Show that $\neg(p \wedge q) \vee (\neg p \wedge q) \equiv \neg q$ and $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$.
9. Let $A = \{3, 4, 12, 24, 48, 72\}$. Let $\leq$ be the partial order defined by $a \leq b$ if a divides b . Draw the Hasse diagram for $(A, \leq)$.
10. Prove that, in a distributive lattice if an element has a complement, then this complement is unique.
11. Explain Homeomorphism and Isomorphism with an example.
12. Does the following graph have Hamiltonian Circuit? If so find one.



(P.T.O.)

13. Show that set of all positive rational number under $*$ forms an abelian group where

$$a * b = \frac{ab}{2}.$$

14. Prove that a tree with n vertices has $n - 1$ edges.

(4 × 3 = 12 weightage)

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

15. a) Explain Universal and Existential Quantifiers with examples.

b) Write the converse, inverse and contra-positive for the statement “If x is odd, then x is not divisible by 2”.

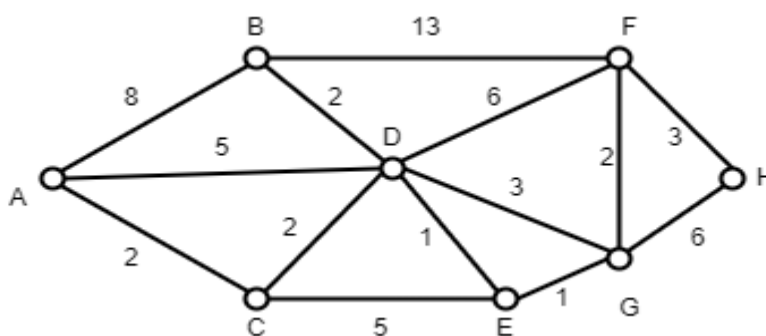
16. Let f, g, h from $V = \{1, 2, 3, 4\}$ into V be defined by

$$f(n) = 5 - n, g(n) = 3, h = \{(1,2), (2,3), (3,4), (4,1)\}.$$

Decide which functions are: a) one-one b) onto c) both d) neither.

17. Show that $(D_{12}, /)$ is a bounded lattice.

18. Using Dijkstra’s Algorithm find the shortest path from A to H for the following weighted graph.



(2 × 5 = 10 weightage)