D1BCA2303 (PAGES 2) **Reg.No.....**

Name: .....

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2023

(Regular/Improvement/Supplementary)

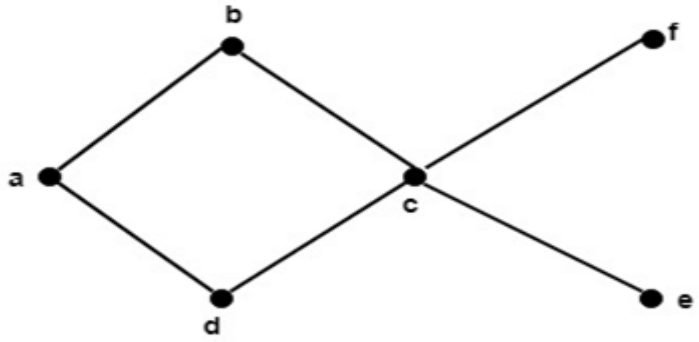
BCA

GBCA1C02T: DISCRETE MATHEMATICS

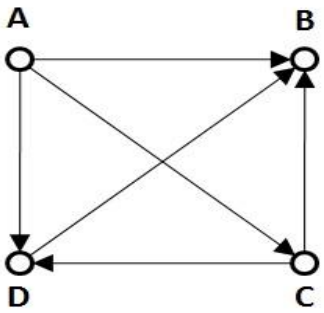
Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks. (Ceiling 20 Marks)

1. Define biconditionalstatement $p \leftrightarrow q$.
2. When do you say that two compound propositions are equivalent?
3. Give an example of relation that is reflexive and symmetric but not transitive.
4. Find the dual of $x \cdot (y + 0)$.
5. Define total order relation. Give an example.
6. Determine all the maximal and minimal elements of the poset whose Hasse diagram is shown in figure.



7. What do you mean by connected components of a graph?
8. Define Euler digraph.
9. State the max flow min cut theorem for networks.
10. Which are the two Kuratowski's graphs?
11. Find in-degree and out-degree of all vertices of the directed graph.



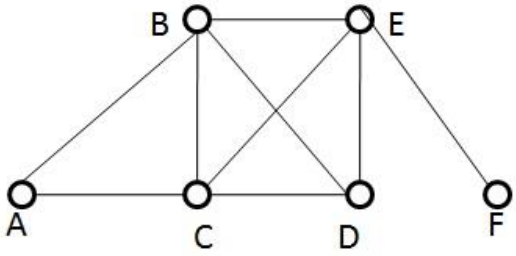
12. Define adjacency matrix of a graph.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)

13. State and prove De Morgan's laws in propositional calculus.
14. If A={1,2,3,5} , B={2,3,4,5,7} and C={2,4,6,7,8,9} verify that
    i) $A \cup B = (A - B) \cup B$ *ii*) $A - (A - B) = A \cap B$ *iii*) $A \cup (B - C) = (A \cap B) - (B \cap C)$
15. Prove the identity using Boolean algebra $\bar{a}b + a\bar{b} + \bar{a}\bar{b} + ab = 1$.
16. Show whether the relation (x, y) ∈ R, if, x / y defined on the set of +ve integers is a partial order relation.
17. Find the number of vertices, the number of edges and the degree of each vertex in the graph given below. Verify also the handshaking theorem in the graph.

G1

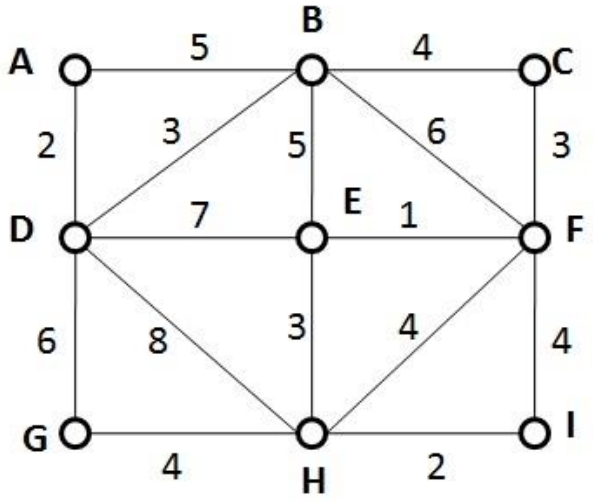


18. Define rooted tree and binary tree.
19. Draw the graph represented by the given adjacency matrix.

$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}.$$

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Draw the complete graph K_5 with vertices A,B,C,D,E. Draw all complete subgraphs of K_5 with 4 vertices.
21. Use Kruskal's algorithm to find a minimum spanning tree for the weighted graph in figure.



(1 x 10 = 10 Marks)