

Roll No.

Total No. of Pages :03

Total No. of Questions : 09

B.Tech. (AI&ML/CSE/ AI & Data Science/AI/CSE/IOT/IT/Data
Science/Internet of Things and Cyber Security including Block Chain
Technology/) (Sem.-4)

DISCRETE MATHEMATICS

Subject Code : BTCS/401/18

M.Code : 77626

Date of Examination : 09-05-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly :

- a) Give an example of a relation which is reflexive, transitive, but not symmetric.
- b) How many people among 200000 people are born at same time (hour, minute, seconds).
- c) How many 8 – letter words can be made using the letters of the words "TRIANGLE", if each word is to begin with T and end with E?
- d) State and Prove Idempotent Laws of Logic Of Proposition.
- e) Define integral domain (I.D).
- f) Find k, if a regular graph with 7 vertices has 12 edges.
- g) Define minimal spanning tree.
- h) Draw a multigraph G whose adjacency matrix $A = \begin{bmatrix} 1 & 3 & 0 \\ 3 & 1 & 2 \\ 0 & 2 & 0 \end{bmatrix}$
- i) Define cut vertex with an example.
- j) Define POSET.

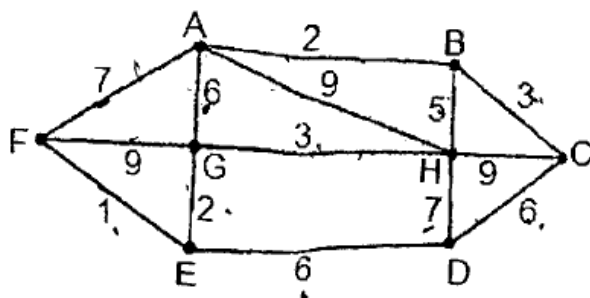
SECTION-B

2. Show that R is a relation in the set $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$, given by $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$. Prove that R is an equivalence relation. Find the set of all elements related to 1 in each case.
3. a) The number of diagonals of a polygon is 20. Find the number of its sides.
b) Find the number of positive integers from 1 to 1000 which are divisible by none of 5, 6 and 8.
4. a) Prove that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.
b) Test the validity of the following argument:
If my brother stands first in the class, I will give him a watch. Either he stood first or I was out of station. I did not give my brother a watch this time. Therefore I was out of station.
5. Show that if the quotient group G/H is abelian, then G may not be abelian.
6. Prove that the number of edges in a complete graph with n vertices is $\frac{n(n-1)}{2}$.

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SECTION-C

7. Use Kruskal algorithm to find spanning tree of minimal weight by showing each step.



8. A subgroup H of a group G is a normal subgroup of G iff the product of two right cosets of H in G is again a right coset of H in G .

9. a) Prove that the function $f: \mathbb{C} \rightarrow \mathbb{R}$, defined by $f(z) = |z|$ is neither one - one nor onto.
- b) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be a real valued function defined by $f(x) = 2x^3 - 1, x \in \mathbb{R}$ and $g(x) = \left[\frac{x+1}{2}\right]^{\frac{1}{2}}, x \in \mathbb{R}$. Show that f and g are bijective.

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