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Total No. of Questions: 18

B.Tech. (Artificial Intelligence & Machine Learning/ Computer Engineering / Computer Science & Engineering / Information Technology/ CSE (Internet of Things and Cyber Security including Block Chain Technology/Artificial Intelligence & Machine Learning)) (Sem.-4)

DISCRETE MATHEMATICS

Subject Code : BTCS-401-18 M.Code : 77626

Date of Examination: 02-07-22

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

Answer briefly:

- 1. Give an example of a relation which is reflexive but neither symmetric nor transitive.
- 2. Determine the domain and range of the relation $R = \{(x, y) : x \in \mathbb{N}, y \in \mathbb{N} \text{ and } x+y=10\}$
- 3. 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?
- 4. Define permutation groups.
- 5. Write down the truth table of $(p \leftrightarrow q) \leftrightarrow r$.
- 6. Is there a simple graph G with six vertices of degree 1, 3, 4, 6, 7?
- 7. Define a complete binary tree.
- 8. Give an example of a connected graph that has an Euler circuit but no Hamiltonian circuit
- 9. What will be the chromatic number of complete graph with n vertices?

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10. Define equivalent sets.

SECTION-B

- 11. Show that intersection of two partial order relations is a partial order relation. But union of two partial order relations need not be a partial order relation. Give suitable example.
- 12. The set C* of all non-zero complex numbers form an infinite abelian group under the operation of multiplication of complex numbers.
- 13. a) How many people must you have to guarantee that at least 5 of them will have birthday on the same month.
 - b) Find the number of positive integers from 1 to 500 which are divisible by at least one of 3, 5 and 7.
- 14. a) Prove that $(p \land q) \lor r = (p \lor r) \land (q \lor r)$
 - b) Prove the validity of the following argument:

If a man is bachelor, he is happy.

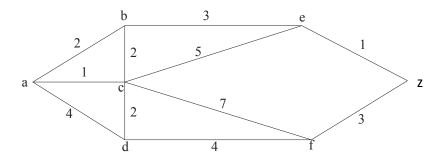
If a man is happy, he dies young.

Therefore bachelors die young.

15. Show that a graph G with n vertices and (n-1) edges and no circuit is connected.

SECTION C

16. Find the shortest path between a and z using Dijkstra's algorithm for the following graph:



- 17. a) Prove that every finite integral domain is a field.
 - b) Simplify the Boolean expression $f(x, y, z) = (x \land y \land z) \lor (x \land y \land z)$. And find its conjunctive normal forms.

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18. A function f is defined on the set of integers as follows:

$$f(x) = \begin{cases} 1+x & 1 \le x < 2 \\ 2x-1 & 2 \le x < 4 \\ 3x-10 & 4 \le x < 6 \end{cases}$$

- a) Find the domain of the function.
- b) Find the range of the function.

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- c) Find the value of f(4).
- It barber could d) State whether f is one - one or many one function.

NOTE: Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.