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Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

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) : $x \in$ N. $y \in$ N 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 ($p \rightarrow q$) $\rightarrow$ 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 $(p \lor q) \land r = (p \land r) \lor (q \land r)$

    b) Prove the validity of the following argument:
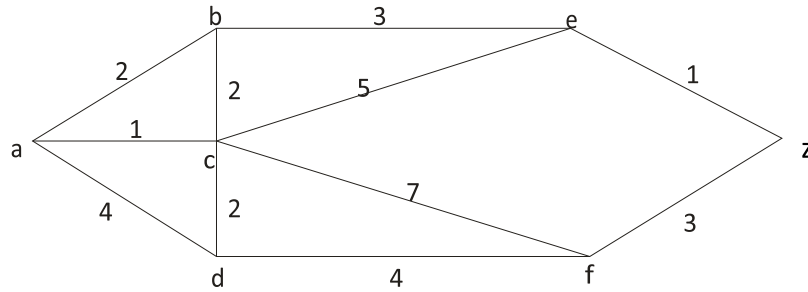
    If a man is bachelor, he is happy.

    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 $f(x, y, z) = (x \lor y \lor z) \land (x \lor y \lor z)$. And find its conjunctive normal forms.

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

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

   a) Find the domain of the function.

   b) Find the range of the function.

   c) Find the value of $f(4)$.

   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.

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