

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  $R = \{(x, y) : x \in \mathbb{N}, y \in \mathbb{N} \text{ and } x+y=10\}$
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?

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  $(p \wedge q) \vee r = (p \vee r) \wedge (q \vee r)$   
 b) Prove the validity of the following argument:

If a man is bachelor, he is happy.

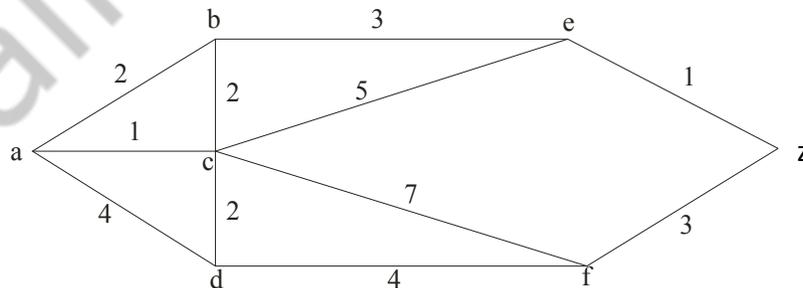
If a man is happy, he dies young.

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  $f(x, y, z) = (x \wedge y \wedge z) \vee (x \wedge y \wedge \bar{z})$ . And find its conjunctive normal forms.

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

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

- 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.**