Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech. (AI&ML/AI&DS/AI/CSE/DS/IOT/IT/(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 : 04-01-2025

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) State Well-Ordering Principle.

(b) If R is an equivalence relation, then show that $\{R^{-1} = (a, b) : (b, a) \in R\}$ is also an equivalence relation.

(c) In how many ways 4 boys and 3 girls be seated in a row so that two girls are together?

(d) Find r if $P(10, r + 1) : P(11, r) = 30 : 11$.

(e) Write the negation of the statement: $p \rightarrow q$.

(f) Use quantifiers to state that the sum of two real numbers is real.

(g) Give an example of a semi group which is not monoid.

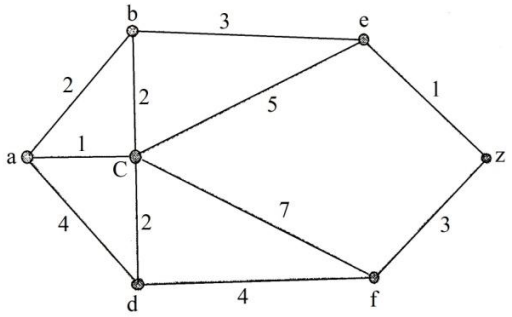
(h) In a Boolean algebra B, show that $x + 0 = x$, $\forall x \in B$.

(i) Give an example of a graph which has Euler circuit but not a Hamiltonian circuit.

(j) Draw a connected graph with one of vertex with degree 5.

SECTION-B

2. Find the shortest distance between a and z in the following graph:



3. Find whole numbers x and y so that $44x+17y = 1$ with $x > 10$ using Euclidean algorithm.

4. How many words each of 3 vowels and 2 consonants, can be formed from the letters of the word 'INVOLUTE'?

5. Show that $p \wedge q$ logically implies $p \leftrightarrow q$.

6. Check whether the set of all even integers forms a group under the binary operation $a * b = 2a + 2b$.

SECTION-C

7. State and prove Fundamental theorem of Arithmetic.

8. (a) If $f(x, y, z) = (x \vee y) \wedge (x \vee y') \wedge (x' \wedge z)$ be a Boolean function, find its disjunctive normal form.

   (b) Prove that a graph is a tree if and only if it is minimally connected.

9. If p, q, r are three statements, then test the validity of the argument $(S_1, S_2; S)$, where $S_1 : p \rightarrow q$, $S_2 : p \rightarrow r$ and $S : p \rightarrow (q \wedge r)$.

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.