CSE

(T) Roll No. .....

PAPER ID—21141

B. Tech. EXAMINATION, 2025

(Fourth Semester)

COMPUTER SCIENCE AND ENGINEERING

Discrete Mathematics

Time : 3 *Hours* *Maximum Marks :* 70

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

Unit I

1. (a) Differentiate between Directed graph and Undirected graph.

   (b) Define Cut set and Cut points in graphs.

   (c) If a/b and a/c, then $a/(bx+cy)$ for all integral values of x and y.

   (d) Define cyclic group and prove that every cyclic group is abelian group.

   (e) Define Integral domain.

   (f) The first term of A.P. is – 4 and 10th terms is 14. Determine the 30th term.

   (g) Let $f(x)=\dfrac{x+1}{x+2}$, $x \neq -2$ and $g(x)=x^2$, then find *fog* and *gof*. **7×2=14**

Unit II

2. (a) If A, B, C are any three sets then prove that $A-(B\cap C)=(A-B)\cup(A-C)$. 7

(b) Let L be the set of all lines in a plane and R be the relation in L defined as $R = \{(L_1, L_2) : L_1$ is prependicular to $L_2\}$. Examine whether R is an equivalance relation or not. 7

3. (a) Let $A = R-\{3\}$ and $B = R-\{1\}$, where R is set of all real numbers. Consider the function $f : A \to B$ defined by $f(x) = \left(\frac{x-2}{x-3}\right)$. Is f is one-one and onto function ? 7

(b) Define tautology and prove that :

(i) $\sim(A \to B) \vee (\sim A \vee (A \cap B))$

(ii) $(P \leftrightarrow Q) \equiv (P \wedge Q) \vee (\sim P \wedge Q)$.

are tautology. 7

Unit III

4. (a) Solve the difference equation :

$$a_r - 4a_{r-1} + 4a_{r-2} = 3r + 2^r .$$ 7

(b) Solve the recurrence relation $a_r - 3a_{r-1} + 10a_{r-2} = 0$ by the method of generating functions with the initial conditions $a_0 = 3$ and $a_1 = 3$. 7

5. (a) Prove that every number $n > 1$ can be expressed as product of primes in one and only one-way. 7

(b) Prove that for any *two* integers a and b where $b > 0$, prove that there exist unique numbers q and r such that $a = bq + r$, where $0 \leq r < b$. 7

Unit IV

6. (a) Consider an algebraic system (G, *) where G is the set of all non-zero real numbers and * is a binary operation defined by $a * b = \frac{ab}{4}$, show that (G, *) is an abelian group. 7

   (b) Show that intersection of two subgroups is also a subgroup of G. 7

7. (a) Define Cosets. If a, b are any *two* elements of a group G and H be any subgroup of G, then prove that $aH - bH$ iff $ab^{-1} \in H$. 7

   (b) Show that set of all even integers is a commutative ring without unity, the addition and multiplication of integers being the composition. 7

Unit V

8. (a) Define Planner graph and Non-planner graph with properties. 7

   (b) State and prove Euler's theorem in graphs. 7

9. (a) Explain multigraph and explain the repersentation of multigraph with examles. 7

   (b) Define shortest path algorithm for weighted graphs and find shortest path between a and z in graph shown below : 7

