(CSE-4-23-5) Roll No. .....

PAPER ID—21141

B. Tech. (CSE) EXAMINATION, 2024

(Fourth Semester)

COMPUTER SCIENCES 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 each from Unit II to Unit V. Unit I is compulsory. All questions carry equal marks.

Unit I

1. (a) Define directed graph and undirected graph.

   (b) Define regular graph and draw a regular graph of degree 2 and 3.

   (c) If $a \mid bc$ and $(a, b) = 1$, then prove that $a \mid c$.

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

   (e) Define Ring.

   (f) If the 5th term of an A.P. is 10 and 10th term is zero, find its 30th term.

   (g) Define composition of functions and if $f : \mathrm{R} \to \mathrm{R}$ and $g : \mathrm{R} \to \mathrm{R}$ defined by $f(x) = x + 1$, $g(x) = e^x$, then find fog.

$7 \times 2 = 14$

Unit II

2. (a) If A, B and C are any three sets, then prove that :

$$A-(B\cup C)=(A-B)\cap(A-C).$$ 7

(b) Let n be a positive integer. Prove that the relation R on the set Z of all integers defined by $(a, b)\in R$ if and only if $(a-b)$ is divisible by n is an equivalence relation on Z. 7

3. (a) State whether the function $f:R\to R$ defined by $f(x)=4x^3-7$ is one-one, onto or sujective function, where R is a set of real numbers. 7

(b) Define tautologies and find out tautology, contingency and contradiction of :

(i) $A\cong A\wedge(A\vee B)$

(ii) $(p\wedge\sim q)\vee(\sim p\wedge q)$. 7

Unit III

4. (a) Solve the difference equation :

$$a_r + 4a_{r-1} + 4a_{r-2} = r^2 - 3r + 5. \quad 7$$

(b) Solve the recurrence relation :

$$a_{r+2} - 3a_{r+1} + 2a_r = 0$$

by the method of generating functions with the initial conditions $a_0 = 2$ and $a_1 = 3$. 7

5. (a) State and prove fundamental theorem of arithmetic. 7

(b) Find the g.c.d. of 256 and 1166 and express it in the form $m.256 \times n.1166$. 7

Unit IV

6. (a) Let Q^+ be a set of all positive rational numbers and '*' be the binary operation defined by $a * b = \frac{ab}{3}$. Prove that Q^+ is a group w.r.t. '*'. 7

(b) Define Monoid. Consider an algebrai system (N, +), where the set N = {0, 1 2, 3, 4.....} the set of natural number and + is an addition operation. Determin whether (N, +) is a monoid.

7. (a) Define Cosets. If a, b are any tw elements of a group G and H be an subgroup of G, then prove that $Ha = Hb$ iff $ab^{-1} \in H$.

(b) Prove that every field is an integra domain.

Unit V

8. (a) Define complete graph and bipartite graph with examples.

(b) Explain undirected complete graph an draw k_4 and k_6.

9. (a) Define multigraph and explain the representation of multigraph with example.