Roll No. ....

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BT-4/J-25

DISCRETE MATHEMATICS

Paper : PC-CS-202A

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit.

UNIT–I

1. (i) Prove the following proposition by PMI.
$1 + 2 + 3 + 4 \ldots\ldots\ldots + n = (n(n + 1))/2.$

(ii) Define Quantifiers and types of Quantifiers with examples.

(iii) Differentiate DNF and CNF with suitable examples. Obtain DNF of $(P \rightarrow Q) \wedge (\neg P \wedge Q)$. 15

2. The students in dormitory were asked whether they had a dictionary (D) or a thesaurus (T) in their rooms. The results showed that 650 students had a dictionary, 150 didn't have a dictionary, 175 had a thesaurus and 50 neither had a dictionary nor a thesaurus. Find the no. of students K (i) who live in dormitory, (ii) have a both dictionary and a thesaurus, (iii) have only a thesaurus, (iv) draw Venn diagram, (v) explain principle of inclusion-exclusion. 15

UNIT–II

3. (i) Consider a set D45 = {1, 3, 5, 9, 15, 45} and let the relation $\leq$ be the relation (divides) be a partial ordering on D45. (a) Determine GLB and LUB of B, B is subset of D45, where B = {9, 15, 45}. (b) Determine GLB, LUB of B, B is subset of D45, where B = {1, 3, 5}. (c) Draw Hasse diagram for D45. 10

(ii) Differentiate between Symmetric, antisymmetric and asymmetric relations with suitable examples. 5

4. Define Relation. Explain various types of relations. Give an example of a relations R1, R2 and R3 on set A = {a, b, c, d} having property :

(i) R1 is irreflexive and antisymmetric.

(ii) R2 is asymmetric and antisymmetric.

(iii) R3 is asymmetric but not transitive. 15

UNIT–III

5. Define functions. Explain various types of functions with suitable example. Show that function $f : R \rightarrow R$ defined as $f(x) = 3x + 4$ for all $x \in R$ is one-one onto. 15

6. Solve the recurrence relation $ar + 2 - 5ar + 1 + 6ar = 2$ by using method of generating functions satisfying the initial conditions $a_0 = 1$ and $a_1 = 2$. 15

UNIT–IV

7. (i) Define Group. Explain properties of a group with suitable example. 10

(ii) Let G = {–1, 0, 1}, verify whether G forms a group under usual addition. 5

8. Define an Abelian Group. Explain properties of Abelian Group. Consider an Algebraic system (G,*), where G is set of real numbers and * is a binary operation defined by $a*b = ab/4$, show that (G,*) is an Abelian Group. 15