Discrete Mathematics

Assignment

Unit 1

Sl. No.	Question	Marks
1.	Determine the converse, inverse, contrapositive for the statement "If it rains for two days then there will be flood"	2
2.	What is extended pigeonhole principle? Explain with suitable example.	2
3.	State De-Morgan's law in propositional logic.	2
4.	State Well Ordering principle and give an example.	2
5.	Consider the following five relations on the set $A = \{1, 2, 3, 4\}$ $R_1 = \{(1,1), (1,2), (2,3), (1,3), (4,4)\}$ $R_2 = \{(1,1), (1,2), (2,1), (2,2), (3,3), (4,4)\}$ $R_3 = \{(1,3), (2,1)\}$ $R_4 = \phi$ = Empty relation $R_5 = A \times A$, the universal relation. Determine which of the relations are reflexive, symmetric, antisymmetric, asymmetric, transitive and equivalence.	6
6.	Construct a Venn Diagram for three sets A, B, C with the following conditions: $$A \cap B = \phi$$$$B \cap C \neq \phi$$$$A \cap C \neq \phi$$	5
7.	Create a truth table for the preposition $$p \rightarrow (q \wedge \neg r)$$ and determine its logical equivalence.	5
8.	Using the principle of inclusion and exclusion, find the number of integers between 1 & 100 that are divisible by 2, 3, or 5. Provide step-by-step calculations.	5
9.	Write the CNF & PCNF of $$(\sim p \rightarrow r) \wedge (q \leftrightarrow p)$$	5

Unit 2

Sl. No.	Question	Marks
1.	What is function? Write conditions of the function to be injective with one example.	2
2.	Define Boolean Algebra.	2
3.	Let $$f(x) = 2x - 1$$ $$g(x) = \sqrt{x}$$ Find the composition $f(g(x))$ & $g(f(x))$ and determine their domains.	5
4.	Demonstrate how generating functions can be used to solve the recurrence relation $$a_n = a_{n-1} + n \quad ; \quad a_0 = 1$$ Providing a specific example.	5
5.	Solve the recurrence relation using Master Method $$T(n) = T\left(\frac{n}{2}\right) + 2^n$$	5
6.	Let $A = \{1, 2, 3, 4, 6, 12\}$ & R be a relation on the set A such that aRb if a divides b. Find (i). Relation R (ii). Diagraph of R (iii). Hasse Diagram of (A, R)	3
7.	Minimise the given function using K-map $$F = ABC'D' + ABC'D + AB'C'D + ABCD + AB'CD + ABCD' + AB'CD'$$	8
8.	What are the different solution methods for the first order recurrence relation with constant coefficient? Explain with examples.	8