

December 2023
 BCA(DS) | BCA-1 SEMESTER
 Mathematics (BCA-23-107)

Time: 3 Hours

Max. Marks: 75

Instructions:

1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short
2. Answer any four questions from Part -B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.
4. Any other specific instructions

PART -A

- Q1 (a) If $A = \{3, 6, 9, 12, 18, 21\}$ & $B = \{4, 8, 12, 16, 20\}$ find $(A \cap B)$ and $(B - A)$. (1.5)
- (b) Write the given set in Roaster form $B = \{x: 4x - 3 < 6, x \in N\}$. (1.5)
- (c) Let $A = \{2, 3, 4\}$ and $B = \{3, 6, 8\}$. Find R where R is the relation 'x divides y' from set A to set B. Also find R^{-1} . (1.5)
- (d) If $f: R \rightarrow R$ is defined by $f(x) = 3x^2 - 8x + 1$, $f[f(x)]$. (1.5)
- (e) What is the difference between Antisymmetric Relation and Asymmetric Relation. (1.5)
- (f) Explain Lattice with the help of example. (1.5)
- (g) What is the Difference between Tautology and Contradiction. (1.5)
- (h) Explain generating functions. (1.5)
- (i) Explain all Basic logical operations. (1.5)
- (j) Explain Regular Expressions. (1.5)

PART -B

- Q2 (a) Out of total 500 cars owners investigated, 400 owned cars A and 200 owned cars B, 50 owned both A and B. Justify the data? (7)
- (b) Determine whether the relation R in the set $A = \{4, 5, 6, 7\}$ and defined as $R = \{(4, 5), (5, 4), (7, 6), (6, 7), (5, 5), (6, 6)\}$ is reflexive, symmetric, transitive or antisymmetric. (8)
- Q3 (a) If P and Q are propositions, then prove the relation $P \rightarrow Q \equiv (\neg P \vee Q)$ by using truth table. (7)
- (b) What is Predicate logic. Difference between Universal and Existential Quantifier. Explain with the help of suitable examples. (8)
- Q4 (a) Find the homogeneous solution of the difference equation $4F_n - 20F_{n-1} + 17F_{n-2} - 4F_{n-3} = 0$. (7)
- (b) What is linear recurrence relation. What are different scenarios have to consider while finding roots. (8)
- Q5 (a) What is Turing Machine, explain with suitable example and also write its real life implications? (7)

- (b) What is the difference between Mealy and Moore and explain Finite Automata. (8)
- Q6 (a) Let n be a positive integer and D_n denote the set of all divisors of n . Considering the partial order of divisibility in D_n , draw Hasse diagram D_{24} , D_{30} . (8)
- (b) Explain PCNF and PDNF with the help of suitable example. (7)
- Q7 (a) Use mathematical induction show that n^3+3n is divisible by 3 for all $n \geq 1$ by induction. (7)
- (b) Explain grammar and Chomsky Hierarchy of Grammars. (8)
