

BCA 106N

B.C.A. (PART-I) EXAMINATION, 2024-25

(Second Semester)

Paper : I

(New Course)

(Discrete Mathematics)



5799

Time : Three Hours]

[Maximum Marks : 75

- Note:** (i) Answer **Five** Questions in all.
(ii) Question No.-1 is **Compulsory**.
(iii) Answer remaining **four** question selecting **two** from each Section A and B.
(iv) All questions carry equal marks.

1. Answer all parts of the following :
- Discuss the basic set operation.
 - Define ring and field.
 - Explain the Proposition and logical operators.
 - What do you mean by binary search tree ?
 - What do you mean by functions ?

Section-A

2. Explain the properties of Cartesian product. Prove that $A - B = A \cap B^1$
3. Discuss the types of relations in a set. Let $A = \{2,3,5\}$ and $B = \{6,8,10\}$ and define a binary relation R from A to B as follows :
For all $(xy) \in A \times B, (x, y) \in R \Leftrightarrow x/y$ write each R and R^{-1} as a set of ordered pairs.

4. Define negation of conjunction and disjunction. Write the negation of each of the following statements :
- (a) If it is raining then the game is cancelled.
 (b) If he studies, he will pass the examination.
5. Show that the mapping $f:R \rightarrow R$ be defined by $f(x) = ax + b$, where $a, b, x \in R, a \neq 0$ is invertible. Define its inverse.

Section-B

6. (a) In a class of 25 students, 12 have taken mathematics, 8 have taken mathematics but not Biology. Find the number of students who have taken mathematics but not biology.
 (b) Let R be a binary relation defined as $R = \{(a, b) \in R^2 : (a - b) \leq 3\}$ determine whether R is reflexive, symmetric and transitive.
7. (a) Show that the relation $(x, y)R(a, b) \Leftrightarrow x^2 + y^2 = a^2 + b^2$ is an equivalence relation on the plane and describe the equivalence classes also.
 (b) Let $f: A \rightarrow B, g: B \rightarrow C$ and $h: C \rightarrow D$ then $ho(gof) = (hog)of$
8. (a) Define combination. If ${}^{100}C_{98} = {}^{999}C_{97} + {}^xC_{901}$; find x .
 (b) Solve $a_{n+2} = 5a_{n+1} + 6a_n = 2$ with initial condition $a_0 = 1$ and $a_1 = -1$
9. Write notes on any two of the following :
- (a) Venn Diagrams
 (b) Binary Operations
 (c) Types of Graphs

