B.C.A. 1st Semester (Full and Re-appear)

Examination, November–2023

MATHEMATICS

Paper–BCA-103

Time allowed : 3 hours] *[Maximum marks : 80*

Note : *Attempt **five** questions in all, selecting **one** question from each unit. **Question No. 1 is compulsory.** All questions carry equal marks.*

1. (a) If $A = \{1, 3, 5, 7\}$, $B = \{2, 4\ 6, 8\}$ and $C = \{0, 4, 5\}$. Write $A \cap B$ and $B \cup C$.

(b) If $A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$. Compute $A - B$.

(c) If the function $f : R \to R$ defined by

$$f(x) = \begin{cases} 3x - 1, & \text{if } x > 3 \\ x^2 - 2, & \text{if } -2 \le x \le 3 \\ 2x + 3, & \text{if } x < -2 \end{cases}$$

Find (i) f(4), (ii) f(–3)

(b) Solve the following system of equations :

$$6x + y - 3z = 5$$

$$x + 3y - 2z = 5$$

$$2x + y + 4z = 8$$

Unit–II

4. (a) Determine whether the Relation R in the set $A = \{4, 5, 6, 7\}$ defined as $R = \{(4, 5), (5, 4), (7, 6), (6, 7)\}$ is reflexive, symmetric, transitive or anti symmetric ?

(b) Prove that f is a bijective function and hence find its inverse, f^{-1} where $f : R \to R$ is defined as $f(x) = 2x + 3$.

5. (a) (i) Evaluate : $\lim_{x \to 0} \dfrac{\sin 2x + \sin 6x}{\sin 5x - \sin 3x}$

(ii) Evaluate : $\lim_{x \to 0} \frac{x}{|x|}$

(b) Find the value of a if the function f is given by

$$f(x) = \begin{cases} 2x - 1, & x < 2 \\ a, & x = 2 \\ x + 1, & x > 2 \end{cases}$$

is continuous at $x = 2$.

Unit–III

6. Differentiate the following w.r.t. x

(i) $(x^2 - 4x + 5)(x^3 - 2)$

(ii) $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$