Exam. Code : 107201
Subject Code : 9053

BCA Ist Semester (Old Sylb.—2016)

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Paper—III

Time Allowed—3 Hours] [Maximum Marks—75

Note :– Attempt any **five** questions. All questions carry equal marks.

1. (a) Solve the system of equations :

$x + 2y + z = 7$

$x + 3z = 11$

$2x - 3y = 1.$

(b) Find the eigen value of matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

2. (a) Evaluate $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$.

(b) Let $f(x) = x^2 - 5x + 6$ find $f(A)$, if $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$.

3. (a) If X = [2, 3, 5, 7, 9] be universal set A = [3, 7] B = [2, 5, 7, 9] prove that $(A \cup B)^c = A^c \cap B^c$.

   (b) In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students knows either Hindi or English. How many students are there in the group ?

4. (a) Define a relation R on the set N of natural numbers by R = [(x, y) y = x + 5], x is natural number less than 4 : x, y ∈ N] ; write the :

   (i) Domain and range of relation

   (ii) Depict this relationship using roaster form.

   (b) A relation R is defined on the set Z of integers (x,y) ∈ R $x^2 + y^2 = 25$ express R and R^{-1} as set of pairs and find their respective domains.

5. (a) If $y = (\sin x + x^2)/ \cot 2x$ find dy/dx.

   (b) $y = \log\left(\frac{a + b\sin x}{a - b\sin x}\right)$ find dy/dx.

6. (a) Evaluate $\int \sin 3x \sin 2x \, dx$.

   (b) Evaluate $\int_1^2 \frac{dx}{(x+1)(x+2)}$.

7. (a) A pair of dice is thrown ; if the two numbers appearing on them are different, find the probability that :

   (i) Sum of the numbers is 6

   (ii) Sum of the numbers is 4 or less.

(b) A bag contains 10 white and 15 black balls. Two balls are drawn in succession without replacement. What is the probability that first is white and second is the black ?

8. (a) A = [1, 3, 5] B = [2, 3] and C = [2, 3, 4, 5] ; a fair die is rolled, find (i) P(A/B) and P(B/A) (ii) P(A/C) and P(C/A).

(b) A man is known to speak truth 3 out of 4 times. He throws a die and repeat that there is six. Find the probability that it is actually a six.