

Exam. Code : 107201
Subject Code : 2010

BCA Semester—I
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) Without expanding the determinant, solve

$$\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$$

- (b) Find the inverse of

$$\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$$

2. (a) Solve the system of equations :

$$3x - 4y - z = 3$$

$$2x - 1y - 3z = 5$$

$$4x + 2y + 3z = 8.$$

(b) Find the Eigen values and vectors of the

$$\begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}.$$

3. (a) Let $A = \{2, 4, 6, 8\}$,

$$B = \{1, 2, 4, 5\} \text{ and}$$

$$C = \{1, 3, 4, 6\}.$$

Find

$$(B \cup C), (A \cap B), (A \cap C) \text{ and } A - B.$$

(b) Find the domain and range of $\frac{x^3 - x^2 + 4x + 7}{3x + 11}$.

4. (a) State and prove de-Morgan's law.

(b) Let $f, g : \mathbb{R} \rightarrow \mathbb{R}$ be two functions defined by $f(x) = x^2 - 1$ and $g(x) = 3x + 1$.

Find $f \circ g, g \circ f, f \circ f, g \circ g$.

5. (a) Find the $\frac{dy}{dx}$ if $x = t^2 + 1, y = t^3 - 1$.

(b) Find the $\frac{dy}{dx}$ when $\sin y + x^2 + 4y = \cos x$.

6. (a) Integrate $\int e^x \sin x \, dx$

(b) Integrate $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} \, dx$

7. (a) Two dice are thrown simultaneously. Find the probability of getting six as a product.

(b) 4 coins are tossed. Find the probability of getting at least one head.

8. (a) The probability that Ram gets scholarship is 0.5 and that Shayam will get is 0.8. What is the probability that at least one of them gets the scholarship?

(b) Three urns are given, each containing red and black balls as :

Unit 1 : 6 red and 4 black balls

Unit 2 : 2 red and 6 black balls

Unit 3 : 1 red and 8 black balls.

An urn is chosen at random and a ball is drawn. The ball drawn is red. Find the probability that the ball is drawn from urn 2 or urn 3.