

Exam. Code : 107201

Subject Code : 8118

Bachelor of Computer Application (BCA) 1st Sem.

(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) Prove it by principle of mathematical induction :

$$\text{If } A = \begin{bmatrix} 11 & -25 \\ 4 & -9 \end{bmatrix}, \text{ then } A^n = \begin{bmatrix} 1+10n & -25n \\ 4n & 1-10n \end{bmatrix}.$$

(b) Find the inverse of matrix $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$.

2. (a) Prove that

$$\begin{bmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{bmatrix} = (a-b)(b-c)(c-a)(a+b+c).$$

- (b) Solve by Cramer's rule $x + 4y - 2z = 3$,
 $3x + y + 5z = 7$, $2x + 3y + z = 5$.

3. (a) If $A = \{2,3,4,5,6\}$, $B = \{3,5,7,9\}$ and $C = \{1,2,3,4\}$ then show that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

(b) State and prove DeMorgan's law.

4. (a) Let $A = \{1,2,3,4,5\}$ and $B = \{2,4,6,8,10\}$. Let $R = \{(a,b) : a \in A, b \in B, a \text{ divides } b\}$ be a relation from A into B . Find R , show that domain of R is A and Range of R is B .

(b) Let $A = \{1/2, 2\}$, $B = \{2,3,5\}$, $C = \{-1, -2\}$ then verify $A \times (B - C) = (A \times B) - (A \times C)$.

5. (a) $y = x^{\sin x} + (\sin x)^{\cos x}$.

(b) Differentiate with respect to x :

$$\sqrt{\log\left\{\left(\sin \frac{x^2}{3} - 1\right)\right\}}$$

6. (a) Evaluate the integral $\int_0^{\frac{\pi}{2}} \frac{1}{4 \sin^2 x + 5 \cos^2 x} dx$.

(b) Find $\int \sin^3 x \cos^3 x dx$.

7. (a) Given the events A and B are such that

$$P(A) = 1/2, P(A \cup B) = \frac{3}{5} \text{ and } P(B) = P \text{ find } P$$

if they are (i) mutually exclusive (ii) independent.

(b) Events A and B are such that $P(A) = 1/2$, $P(B) = 7/12$ and $P(\text{not } A \text{ or not } B) = 1/4$. State whether A and B are independent.

8. (a) A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.

(b) A letter is known to come either from TATANAGAR or KOLKATA. On the envelope, only the two consecutive letters TA are visible. What is the probability that the letter has come from (i) KOLKATA (ii) TATANAGAR ?