

OBCA/M-15 19005

MATHEMATICAL FOUNDATION-I

Paper-BCA-105

Time Allowed : 3 Hours] [Maximum Marks : 80

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. Question No. **9** is compulsory.

UNIT-I

1. (a) Prove that $A - (B \cup C) = (A - B) \cap (A - C)$. 8
- (b) In a group of 52 persons, 16 drink tea but not coffee and 33 drink tea. Find how many drink tea and coffee both also how many drink coffee but not tea. 8

2. (a) Using $\epsilon - \delta$ definition, prove that $|x|$ is a Continuous function. 8

- (b) If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, $x \neq y$, find $\frac{dy}{dx}$. 8

UNIT-II

3. (a) Solve $\frac{dy}{dx} = e^x - y + x^2 e^{-y}$. 8

- (b) Solve $(x^2 + y^2) dx - 2xy dy = 0$. 8

19005/K/734/250

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4. (a) Solve $(D^2 - 2D + 1)y = x e^x \sin x$. 8

(b) Solve $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^4$. 8

UNIT-III

5. (a) Prove that $5^n > 3^n$, $\forall n \in \mathbb{N}$ by P.M.I. 8

(b) Prove that $(p \rightarrow q) \cap (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology. 8

6. (a) In a group G if $(xy)^2 = x^2 y^2$ for all $x, y \in G$, then G is an abelian group. 8

(b) Define Ring with example. 8

UNIT-IV

7. (a) Solve $6x + y - 3z = 5$; $x + 3y - 2z = 5$; $2x + y + 4z = 8$ by Matrix method. 8

(b) If $A = \begin{bmatrix} 2 & -3 \\ 4 & 6 \end{bmatrix}$ verify that $(\text{adj } A)^{-1} = (\text{adj } A^{-1})$. 8

8. Diagonalize $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -5 & 3 \\ 0 & -6 & 4 \end{bmatrix}$ if possible. 16

UNIT-V

Compulsory Question

9. (a) Find the inverse of Matrix $\begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}$. 4

(b) Define group with example. 3

(c) Find the differential equation of the curve $x^2 + y^2 + 2gx = 0$, where g is arbitrary constant. 3

(d) Write down all subset of $\{a, b, c\}$. 3

(e) $y = \sqrt{x + \sqrt{x}} + \sqrt{x + \dots \dots \dots \infty}$. Prove that

$(2y - 1) \frac{dy}{dx} = 0$. 3