

Roll No.

Printed Pages : 2

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BCA / M-16
MATHEMATICAL FOUNDATIONS-II
Paper-BCA-123

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) Show that $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology. 8
(b) Prove that $3^n > 2^n$ by P.M.I. for all $n \in \mathbb{N}$. 8
2. (a) Prove that $n(n+1)(n+2)$ is a multiple of 6 by using P.M.I. for all $n \in \mathbb{N}$. 8
(b) Show that $\sim(p \leftrightarrow q) \equiv (\sim p) \leftrightarrow q = p \leftrightarrow \sim q$. 8

Unit-II

3. (a) Prove that a group of four elements is an abelian group. 8
(b) Define Ring with example. 8
4. (a) Prove that the intersection to two subring is a ring. 8
(b) Prove that $[\{0, 1, 2, 3, 4\}, +_5, \times_5]$ is a field. 8

Unit-III

5. (a) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$, show that $A^3 - 23A - 40I = 0$. 8

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(2)

(b) For $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y so that $A^2 + xI = yA$. 8

6. (a) Solve $x + 2y = 4$; $2x + 5y = 9$ by Matrix Method. 8

(b) If $A = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 2 & 4 \end{bmatrix}$ prove that
 $(AB)^{-1} = B^{-1}A^{-1}$. 8

Unit-IV

7. Find eigen values and eigen vectors of matrix

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix} \quad 16$$

8. Verify Cayley-Hamilton theorem for matrix $A = \begin{bmatrix} 0 & 0 & 1 \\ 3 & 1 & 0 \\ -2 & 1 & 4 \end{bmatrix}$
and hence find A^{-1} . 16

Unit-V (Compulsory)

9. (a) Define Group with example. 4

(b) Define Prime ideal of ring. 2

(c) Define characteristic equation of a square matrix. 2

(d) Define Rank of a Matrix. 2

(e) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 1 & 0 \end{bmatrix}$ find AB . 2

(f) Define symmetric matrix with example. 2

(g) Define subgroup. 2