

Roll No. 0004609402

Printed Pages : 3

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BCA / M -15

MATHEMATICAL FOUNDATION-II

Paper-BCA-123

Time allowed : 3 hours]

[Maximum marks : 80

Note : Attempt five questions in all. Q. No. 1 is compulsory.

Attempt one question from each unit.

(Compulsory Question)

1. (a) Define abelian group. 3
- (b) Prove that $p \vee \sim(p \wedge q)$ is a tautology. 3
- (c) Evaluate $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} [1 \ 2 \ 3 \ 4]$ 3
- (d) If O is latent root of matrix A. Then A is singular matrix. 3
- (e) Prove that if $a^2 = a$, $a \in G$. Then $a = e$. 2
- (f) Define Rank of Matrix. 2

Unit-I

2. (a) Show that $((\sim p) \wedge Q) \wedge (Q \wedge R) \wedge (\sim Q)$ is a tautology. 8
- (b) Prove that $5^n > 3^n$, $\forall n \in \mathbb{N}$, by P.M.I. 8
3. (a) Show that $r(p \leftrightarrow q) \equiv (rp) \leftrightarrow q \equiv p \leftrightarrow rq$ 8
- (b) Prove that $3^{2n+2} - 8n - 9$ is divisible by 64. 8

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P.T.O.

Unit-II

4. (a) Prove that group G is abelian if and only if $(a b)^2 = a^2 b^2, \forall a, b \in G$. 8
- (b) Show that a subgroup H of a group G is normal if and only if $xHx^{-1} = H, \forall x \in G$. 8
5. (a) Define RING with example. 8
- (b) Define subring; Ideal, Principal Ideal, Maximal Ideal of a Ring. 8

Unit-III

6. (a) If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$, Find $f(A)$ If $f(x) = x^2 - 3x - 7$. 8
- (b) If $A = \begin{bmatrix} a & b \\ 0 & 1 \end{bmatrix}, a \neq 1$. Prove that $A^n = \begin{bmatrix} a^n & \frac{b(a^n - 1)}{a - 1} \\ 0 & 1 \end{bmatrix}$ for $n \in \mathbb{N}$. 8
7. (a) If $A = \begin{bmatrix} 5 & -2 \\ 3 & -2 \end{bmatrix}$,
Prove that $A (\text{adj } A) = (\text{adj } A) A = |A| I_2$ 8
- (b) Solve $x + y + z = 2; 2x - y = 3; 2y + z = 0$ by Matrix Method. 8

(3)

Unit-IV

8. (a) State and prove Cayley – Hamilton Theorem. 8

(b) Find eigen values and eigen vector of Matrix

$$A = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix} \quad 8$$

9. Diagonalize $A = \begin{bmatrix} 6 & 0 & 0 \\ 0 & 7 & -4 \\ 9 & 1 & 3 \end{bmatrix}$ if possible. 16