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BCA / M-19
MATHEMATICAL FOUNDATION-II
Paper-BCA-123

*Time allowed : 3 hours]**[Maximum marks : 80]*

Note : Attempt five questions in all. Question No. 1 is compulsory. Attempt four more questions selecting exactly one question from each unit. All questions carry equal marks.

Compulsory Question

1. Explain following: $8 \times 2 = 16$
- (a) Truth table
 - (b) Mathematical induction
 - (c) Group
 - (d) Cosets
 - (e) Singular matrix
 - (f) Rank of a matrix
 - (g) Eigen vector
 - (h) Skew-Hermitian matrix.

Unit-I

2. (a) Show that $\sim(p \Leftrightarrow q) \equiv p \Leftrightarrow \sim q$ 8
- (b) Using the principle of mathematical induction, prove that for all $n \in N$, $11^{n+2} + 12^{2n+1}$ is divisible by 133. 8

3. State and prove the laws of logic.

Unit-II

4. (a) If (G, \cdot) be a group; then solve the equation
 $a \cdot x \cdot a = b$ in G 8
- (b) Let H be a subgroup of group G and define
 $N(H) = \{\alpha \in G : \alpha H = H\alpha\}$. Prove that $N(H)$ is a
 subgroup of G 8
5. (a) Let $H = \{5x : x \in Z\}$ be a subgroup of I . Prepare the
 composition table for Z/H . 8
- (b) Let D be an integral domain and F be a field. Define a
 mapping $\psi : D \rightarrow F$ such that
 $\psi(\alpha) = (\alpha, 1)$ for all $\alpha \in D$. Then show that ψ is an
 isomorphism of D into F . 8

Unit-III

6. Find A^{-1} , where $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix}$. Hence, solve the
 system of linear equations:
 $x + 2y - 3z = -4$
 $2x + 3y + 2z = 2$
 $3x - 3y - 4z = 11$

(3)

7. Solve the following system of equations :

$$x - y + 2z - 3w = 0$$

$$3x + 2y - 4z + w = 0$$

$$4x - 2y + 9w = 0$$

16

Unit-IV

8. (a) Prove that the eigen values of a triangular matrix are the diagonal elements of the matrix. 8

- (b) Prove that any two characteristic vectors corresponding to two distinct characteristic roots of a Hermitian matrix are orthogonal. 8

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

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