Roll No. ....

2015/19

1928

Printed Pages : 3

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. 16

Unit–II

4. (a) If (G, .) be a group; then solve the equation a. x. a = b in G. 8

(b) Let H be a subgroup of group G and define $N(H) = \{\alpha \varepsilon G : \alpha H = H\alpha\}$. Prove that N(H) is a subgroup of G. 8

5. (a) Let $H = \{5x : x \varepsilon Z\}$ 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 $\alpha \varepsilon D$. 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 :

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

$2x + 3y + 2z = 2$

$3x - 3y - 4z = 11$ 16

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