Roll No. ..... Total Pages : 3

BAE/A-20 **502**

MATHEMATICS
(Algebra and Trigonometry)
Paper : BM-101

Time : Three Hours] [Maximum Marks : 45

Note : Attempt *five* questions, selecting at least *one* question from each section.

SECTION–I

1. (a) Define Symmetric matrix. If A is a square matrix then prove that $A + A'$ is symmetric. 5

(b) Show that $\begin{bmatrix} 0 & 6 & 8 \\ -6 & 0 & -5 \\ -8 & 5 & 0 \end{bmatrix}$ is skew symmetric. 4

2. (a) Find the rank of $\begin{bmatrix} 0 & -1 & 2 \\ 4 & 3 & 1 \\ 4 & 2 & 3 \end{bmatrix}$. 4

(b) Show that the vectors (3, 1, –4) (2, 2, –3) form a linearly independent set. 5

3. Find the eigen values and eigen vectors of matrix $\begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$. 9

SECTION–II

4. (a) Solve the equation $x^4 - 20x^3 + 140x^2 - 400x + 384 = 0$, two roots being 2 and 8. 5

(b) Find an equation whose roots are equal in magnitude but opposite in sign to the roots of the equation

$$x^5 + 11x^4 + 7x^3 - 16x^2 - 12x + 15 = 0.$$ 4

5. Solve the equation $x^3 - 12x - 65 = 0$ by Cardon's method. 9

SECTION–III

6. (a) Every cyclic group is an abelian group. Prove it. 5

(b) If H_1 and H_2 are two subgroups of G, then show that $H_1 \cap H_2$ is also a subgroup of G. 4

7. (a) Prove that every subgroup of an abelian group is always normal. 4

(b) Show that Z (the set of all integers) is not a group w.r.t. multiplication. 5

8. Define a ring and give an example of

(a) a non-commutative ring with unity.

(b) a commutative ring with unity. 9

SECTION–IV

9. (a) Prove that $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{3} = \frac{\pi}{4}$. 5

(b) Using DeMoivre's theorem, solve the equation $x^4 + x^3 + x^2 + x + 1 = 0$. 4

10. (a) Show that $\log (1 + \cos 2\theta + i \sin 2\theta) = \log (2 \cos \theta) + i\theta$. 5

(b) Express $\log [\log (\cos \theta + i \sin \theta)]$ in the form $A + iB$. 4