UNIT – V

9. (a) If A is a square matrix then $A + A'$ is symmetric.

$2 \times 6 = 12$

(b) Find the rank of the matrix :

$$A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

(c) Explain Descarte's rule of signs.

(d) State fundamental theorem of algebra.

(e) Define linear dependence and linear independence.

(f) Define monic polynomial.

Roll No. .....

91053

B. Sc. (Ist Sem.) Maths (Honours)

Examination – December, 2015

ALGEBRA

Paper : BHM-111

Time : Three Hours] *[Maximum Marks : 60*

Before answering the question, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. 9 (Unit - V) is ***compulsory***.

UNIT – I

1. (a) Show that every square matrix is uniquely expressible as the sum of Hermitian and skew Hermitian matrix. 6

(b) Find the rank of the matrix : 6

$$\begin{bmatrix} 3 & 4 & 1 & 2 \\ 3 & 2 & 1 & 4 \\ 7 & 6 & 2 & 5 \end{bmatrix}$$

2. (a) Find the characteristic vectors of the matrix

$$A=\begin{bmatrix}1 & 2 & 3\\ 0 & -4 & 2\\ 0 & 0 & 7\end{bmatrix}$$ 6

(b) Verify Cayley Hamilton theorem for the matrix A and compute A^{-1} where : 6

$$A=\begin{bmatrix}2 & 1 & 2\\ 5 & 3 & 3\\ -1 & 0 & -2\end{bmatrix}$$

UNIT – II

3. (a) Solve the following system of equations completely : 6

$$2x-y+3z=3$$
$$x+2y-z-5w=4$$
$$x+3y-2z-7w=5$$

(b) Prove that product of two unitary matrices is unitary. 6

4. (a) Express $x_1y_1-2x_1y_3+3x_2y_1+x_2y_2-3x_2y_3-x_3y_1-x_3y_2-x_3y_3$ into matrix form and transform into canonical form. 6

(b) Prove that $9x^2+y^2+4z^2+6xy-12xz-4yz$ is positive and semi-definite. 6

UNIT – III

5. (a) Solve the equation $x^4+4x^3+6x^2+4x+5=0$ given that one root is $\sqrt{-1}$. 6

(b) Solve the equation $x^4-8x^3+14x^2+8x-15=0$ roots being in A. P. 6

6. (a) Find the common roots of the equations $x^4+3x^3-5x^2-6x-8=0$ and $x^4+x^3-9x^2+10x-8=0$. Hence solve them completely. 6

(b) If α,β,γ are the roots of the equation $x^3+ax^2+bx+c=0$, form an equation whose roots are $\frac{\alpha}{\beta+\gamma},\frac{\beta}{\gamma+\alpha},\frac{\gamma}{\alpha+\beta}$. 6

UNIT – IV

7. (a) Apply Descarte's rule of signs to discuss the nature of roots of the equation $x^4+15x^2+7x-11=0$. 6

(b) Solve by Cardon's method : 6

$$9x^3+6x^2-1=0$$

8. (a) Solve by Descarte's method $x^4-4x^3+5x+2=0$. 6

(b) Solve $x^4+2x^3-7x^2-8x+12=0$ by Ferrari's method. 6