

PRACTICE PROBLEMS FOR MINOR - 1

1. Reduce the following matrix to normal form and hence find its rank

$$\begin{array}{l} \text{a) } \begin{bmatrix} 1 & 4 & 3 & -2 & 1 \\ -2 & -3 & -1 & 4 & 3 \\ -1 & 6 & 7 & 2 & 9 \\ -3 & 3 & 6 & 6 & 12 \end{bmatrix} \quad \text{b) } \begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix} \quad \text{c) } \begin{bmatrix} 2 & 3 & -1 & 1 \\ 1 & -1 & -2 & -3 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & 7 \end{bmatrix} \end{array}$$

2. a) Solve the system of equations $3x + 3y + 2z = 1$, $x + 2y = 4$, $10y + 3z = -2$, $2x - 3y - z = 5$
b) For what values of k the equations $x + y + z = 1$, $2x + y + 4z = k$, $4x + y + 10z = k^2$ have a solution and solve them completely in each case
c) Investigate for what values of a and b the following system of equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + az = b$ have (i) no solution (ii) a unique solution (iii) Infinite number of solutions
3. Solve the equations $2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + z = 8$ by LU decomposition method

4. Verify Cayley Hamilton Theorem for the matrix $A = \begin{pmatrix} -1 & 0 & 6 \\ 3 & 6 & 1 \\ -5 & 1 & 3 \end{pmatrix}$

5. Reduce the following quadratic forms to a canonical form by an orthogonal transformation and discuss the nature of it

a) $2xz - 2yz + 2xy$ b) $3x^2 + 2y^2 + 3z^2 - 2yz - 2xy$ c) $6x^2 + 3y^2 + 3z^2 - 2yz$

6. Solve the following differential equations

a) $x^2 y(1 + xy^2)dy = xdx$ b) $(xy^2 - e^{1/x^3})dx - x^2 ydy = 0$

c) $(xy^3 + y)dx + 2(y^4 + x + x^2 y^2)dy = 0$

d) $(xy^2 \sin xy + y \cos xy)dx + (x^2 y \sin xy - x \cos xy)dy = 0$

e) $(x + y + 1)\frac{dy}{dx} = 1$ f) $e^x \frac{dy}{dx} = 2xy^2 + ye^x$

Intelligence may fail sometimes but hard work never fails

** ## @@ All the Best @@ ## **