To be presented in front of class by Roll no. 29,30,31 after lecture (if any)

Due date: 21-01-2022

Roll no: 29

- Express the following matrix as the product of elementary matrices.

$$\begin{pmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 3 & 5 & 6 \end{pmatrix}$$

- Use the elementary row operations to find the row reduced echelon form and then evaluate rank, and nullity of the following matrix.

$$\begin{pmatrix} 0 & 1 & 1 & -1 & 2 \\ 1 & 2 & -1 & 0 & 3 \\ 3 & 7 & -2 & -1 & 0 \end{pmatrix}$$

- **Note that:** The matrix A is said to be column equivalent to matrix B if matrix B can be obtained by a finite sequence of elementary column operations on matrix A.

  Prove that column equivalence is an equivalence relation.
- Prove that rank of two row equivalent matrices is same.

Roll no: 30

- Express the following matrix as the product of elementary matrices.

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{pmatrix}$$

- Use the elementary row operations to find the row reduced echelon form and then evaluate rank, and nullity of the following matrix.

$$\begin{pmatrix} 0 & 0 & 1 & 1 & 2 \\ 1 & 2 & 3 & 4 & 7 \\ 2 & 4 & -2 & -1 & -3 \end{pmatrix}$$

- **Note that:** The matrix A is said to be column equivalent to matrix B if matrix B can be obtained by a finite sequence of elementary column operations on matrix A.

  Prove that matrix A is column equivalent to matrix B if there exists an invertible matrix Q such that $B = AQ$.
- Prove that rank of matrix is same as rank of the transpose of the matrix.

Roll no: 31

- Express the following matrix as the product of elementary matrices.

$$\begin{pmatrix} 3 & -4 \\ 1 & 4 \end{pmatrix}$$

- Use the elementary row operations to find the row reduced echelon form and then evaluate rank, and nullity of the following matrix.

$$\begin{pmatrix} 1 & 0 & 1 & 4 & 2 \\ 1 & 3 & 4 & 0 & 3 \\ 2 & 6 & -2 & 1 & 6 \end{pmatrix}$$

- **Note that:** The matrix A is said to be column equivalent to matrix B if matrix B can be obtained by a finite sequence of elementary column operations on matrix A.

  Prove that any invertible matrix is column equivalent to identity matrix.
- Prove that for any non-zero column matrices A and B, the matrix $P = AB^T$ is rank one matrix. **(Note:** B^T denotes the transpose of column matrix B **)**
