ENGINEERING MATH lll
(TH-I)
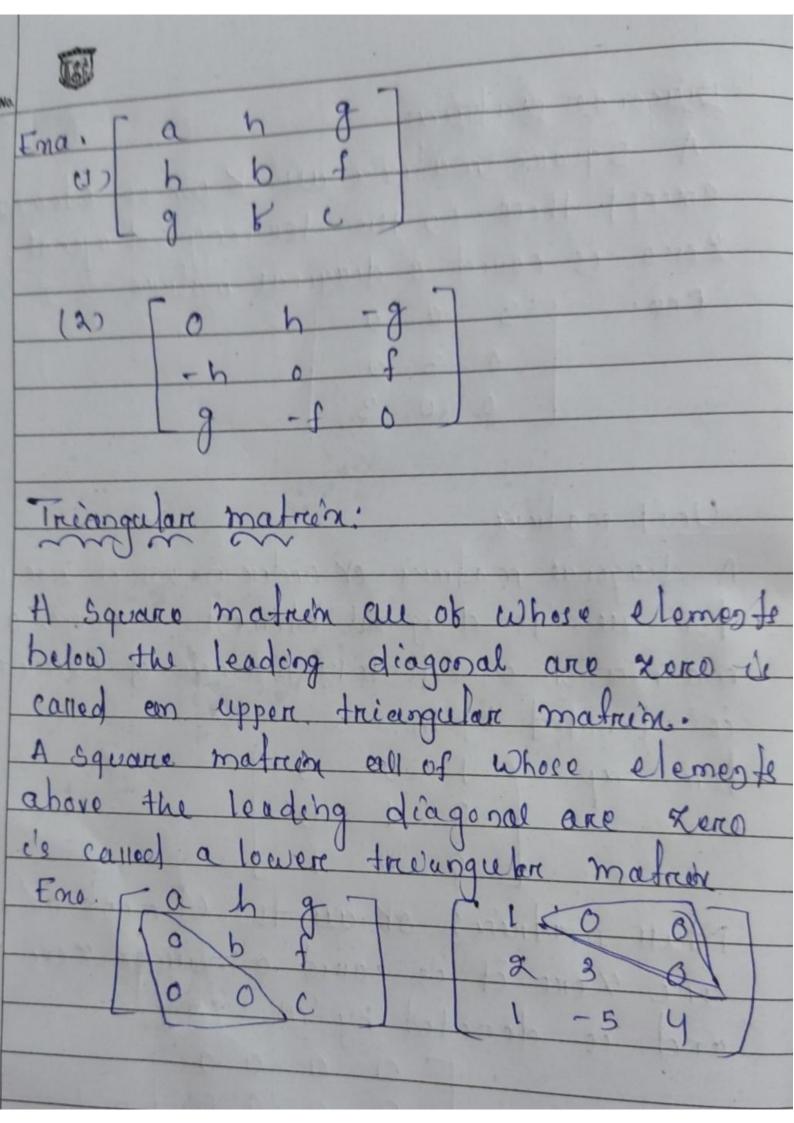
3rd SEM ELECTRICAL ENGG.

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What is matrix?

A system of mn numbers arranged in a rectangular formation along m rows and columns and bounded by the bracket [ ] called an m by n matrix. Which is writt as m×n matrix.

→ It is also denoted by a single capital letter.

Types of matrix: 1. Row Matrix

A matrix having a single row is called a row matrix.

Exa. [1, 3, 5, 7]

2. Column matrix:

A matrix having a common single com is called Column matrix.

Exa $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

3. Square matrix:

A matrix having n rows and n columns is called square matrix of order n.

Exa. $\begin{bmatrix} 4 & 5 \\ 6 & 7 \end{bmatrix}$ $\begin{bmatrix} 2 & 3 & 5 \\ 3 & 2 & 8 \\ 9 & 2 & 5 \end{bmatrix}$

Diagonal Matrix

A square matrix all of whose elements except those in the leading diagonal, are zero is called a diagonal matrix

Exa.
$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

Unit matrix

A diagonal matrix of order n which has unity for all its diagonal element is called a unit matrix or an identity matrix of order n and is denoted by I_n.

for exp.
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Null matrix: of all the element of a matrix are zero. it is called a null or zero matrix and is denoted by '0' e.g

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Symmetric and skew-symmetric matrices

A square matrix $A = [a_{ij}]$ is said to be symmetric when $a_{ij} = a_{ji}$ $\forall$ i & j

Ena:

(1)
$$\begin{bmatrix} a & h & g \\ h & b & f \\ g & k & c \end{bmatrix}$$

(2)
$$\begin{bmatrix} 0 & h & -g \\ -h & 0 & f \\ g & -f & 0 \end{bmatrix}$$

Triangular matrix:

A Square matrix all of whose elements below the leading diagonal are zero is called an upper triangular matrix.

A square matrix all of whose elements above the leading diagonal are zero is called a lower triangular matrix

Ena.
$$\begin{bmatrix} a & h & g \\ 0 & b & f \\ 0 & 0 & c \end{bmatrix} \qquad \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 1 & -5 & 4 \end{bmatrix}$$

Rank of matrix:

A matrix is said to be rank r when (i) it has atleast one non zero minor of order r.

(ii) Every minor of order higher than r vanishes.

For Q-1 Determine the rank of the matrix

(c) $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$

Operate $R_2 \leftarrow R_2 - R_1$

$R_3 \leftarrow 2R_1$

$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & -1 \\ 0 & 2 & -1 \end{bmatrix} = A \ (say)$

$|A| = \begin{vmatrix} 1 & 2 & 3 \\ 0 & 2 & -1 \\ 0 & 2 & -1 \end{vmatrix} = 1(-2+2) - 2(0) + 3(0)$

$= 0$

Now $\begin{vmatrix} 1 & 2 \\ 0 & 2 \end{vmatrix} = 2 \neq 0$

$f(A) = 2,$

hence the rank of the given matrix is 2