(xiv) **Conjugate of a matrix** : Let $A = (a_{ij})_{m,n}$ be a matrix. Let $\overline{a}_{ij}$ denote the Complex Conjugate of a_{ij}. Then the matrix $(\overline{a}_{ij})_{m,n}$ is called the Conjugate of A and is denoted by $\overline{A}$. Example:- $A = \begin{bmatrix} 1+i & 1-i \\ 1+2i & 2-2i \end{bmatrix}$, $\overline{A} = \begin{bmatrix} 1-i & 1+i \\ 1-2i & 2+2i \end{bmatrix}$

(xv) **Transposal Conjugate of a matrix** (Tranjugate of matrix) :- The transpose of $\overline{A}$ is called the transposed Conjugate of A and is denoted by A^θ.

Thus, $A^\theta = (\overline{A})' = (\overline{A'})$.

$(A+B)^T = A^T + B^T$
$(A+B)^\theta = A^\theta + B^\theta$
$(AB)^\theta = B^\theta A^\theta$
$(A^n)^\theta = (A^\theta)^n$

(xvi) **Hermition matrix** : A square matrix A is called a Hermition matrix if $A^\theta = A$. i.e. if $(i,j)^{th}$ element of A is the Complex Conjugate of the $(j,i)^{th}$ element of A.

(xvii) **skew - Hermitian matrix** : A square matrix A is called skew Hermitian if $A^\theta = -A$.

(xviii) **Unitary matrix** ! A square matrix A is called a unitary matrix if $A^\theta A = A A^\theta = I$. Example:- $A = \frac{1}{\sqrt{3}}\begin{bmatrix} 1+i & 1 \\ -1 & 1-i \end{bmatrix}$

Proof:- $\overline{A} = \frac{1}{\sqrt{3}}\begin{bmatrix} 1-i & 1 \\ -1 & 1+i \end{bmatrix}$

$A^\theta = (\overline{A})^T = (\overline{A})' = \frac{1}{\sqrt{3}}\begin{bmatrix} 1-i & -1 \\ 1 & 1+i \end{bmatrix}$

$A A^\theta = \frac{1}{3}\begin{bmatrix} 1+i & 1 \\ -1 & 1-i \end{bmatrix}\begin{bmatrix} 1-i & -1 \\ 1 & 1+i \end{bmatrix} = \frac{1}{3}\begin{bmatrix} \underset{3}{1+1+1} & 0 \\ \underset{0}{-1+i-i+1} & \underset{3}{1+1+1} \end{bmatrix} = \underbrace{\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}}_{=I}$