Transpose of a Matrix.

The matrix obtained from a given matrix A by changing its rows into columns or columns into rows is called transpose of Matrix A and is denoted by A^T or A'.
From the definition it is obvious that if order of A is $m \times n$, then order of A^T is $n \times m$

Example: Transpose of matrix $\begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{bmatrix}_{2\times 3}$ is $\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \\ a_3 & b_3 \end{bmatrix}_{3\times 2}$

Properties of transpose: Let A and B be two matrices then

(i) $(A^T)^T = A$

(ii) $(A+B)^T = A^T + B^T$, A and B being of the same order

(iii) $(kA)^T = kA^T$, k be any scalar (real or complex)

(iv) $(AB)^T = B^T A^T$, A and B being conformable for the product AB

(v) $(A_1 A_2 A_3 \ldots\ldots A_{n-1} A_n)^T = A_n{}^T A_{n-1}{}^T \ldots\ldots\ldots A_3{}^T A_2{}^T A_1{}^T$

(vi) $I^T = I$