Step-1

Suppose A is $m\times n$ matrix and its columns are $c_1, c_2, \ldots, c_n$ which pair wise orthogonal and unit vectors are.

So, it follows that

$C_i^T C_j = 0$ For every $1 \le i \ne j \le n$ and

$C_i^T C_i = 1$ For every $1 \le i \le n$ â€¦â€¦ (1)

Then,

$$A^T = \begin{bmatrix} c_1^T \\ c_2^T \\ . \\ . \\ . \\ c_n^T \end{bmatrix}$$ Is $n\times m$ matrix

Step-2

Thus,

$$A^T A = \begin{bmatrix} c_1^T \\ c_2^T \\ \vdots \\ c_n^T \end{bmatrix} \begin{bmatrix} c_1 c_2 \cdots c_n \end{bmatrix}$$

$$= \begin{pmatrix} c_1^T c_1 & \ldots & c_1^T c_n \\ \vdots & \ddots & \vdots \\ c_n^T c_1 & \cdots & c_n^T c_n \end{pmatrix}$$ Is $n\times n$ matrix

Step-3

In view of (1), obtain this matrix $$A^T A = \begin{bmatrix} 1 & 0 & - & - & 0 \\ 0 & 1 & - & - & 0 \\ - & - & - & - & - \\ - & - & - & - & - \\ 0 & 0 & - & - & 1 \end{bmatrix}$$

Hence, $A^T A$ is an $\boxed{n\times n \text{ identity matrix}}$.