3. Show that a matrix which is both symmetric and skew symmetric is a zero matrix.
Ans :
Given**:** Symmetric and Skew symmetric matrix.
For symmetric matrix

$$A' = A$$

and for skew symmetric matrix

$$A' = -A.$$

Let

$$A$$

be a matrix with elements

$$a_{ij}.$$

As,

$$A$$

is both symmetric and skew symmetric,

$$\Rightarrow a_{ij} = a_{ji} \text{ (i)}$$
$$\Rightarrow a_{ij} = -a_{ji}$$
$$\Rightarrow a_{ij} + a_{ji} = 0 \text{ (ii)}$$
$$\text{from (i) and (ii),}$$
$$2a_{ij} = 0$$
$$\therefore a_{ij} = 0$$

Therefore,

$$A$$

is zero matrix.