

3.5

(2) We know that we can decompose  $\sigma$  into ~~the~~ some product of transpositions,

$$\sigma = (a_1, a_2)(a_3, a_4) \dots (a_k, a_{k+1})$$

Thus,

$$\sigma^2 = (a_1, a_2)(a_3, a_4) \dots (a_k, a_{k+1})(a_1, a_2)(a_3, a_4) \dots (a_k, a_{k+1})$$

Which is a product of an even number of transpositions.

Hence  $\sigma^2$  is even.