Q3: First consider any set of 3−cycles. Each 3−cycle can be written as the product of two 2−cycles. Hence any product of 3−cycles will be an even product of 2−cycles. Therefore if we take any product of 3−cycles, we will have an element of A_n. Now suppose that $\sigma \in A_n$. For an even k, we can write

$$\sigma = (a_1 b_1)(a_2 b_2)\dots(a_k b_k) = (a_1 b_1)(a_1 b_2)^2(a_2 b_2)\dots(a_{k-1} b_k)^2(a_k b_k) = (a_1 b_2 b_2)\dots(a_k a_{k-1} b_k)$$

Hence any element of A_n can be written as the product of 3−cycles.