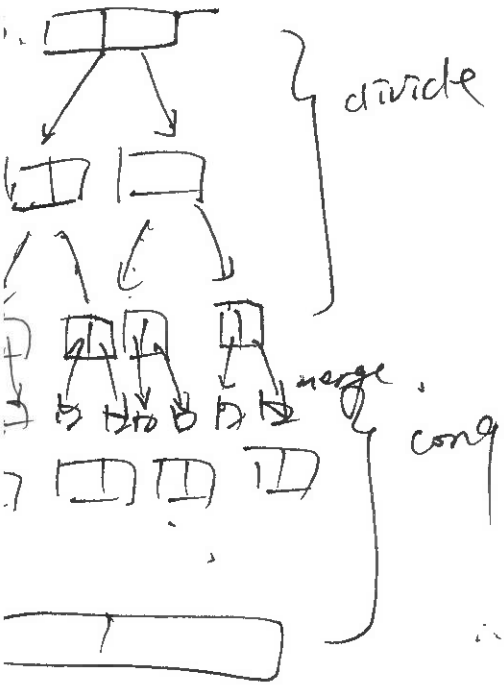
Part 4.

1. The worst case for an array with size 16 is the whole array with decedent sorting pattern. In this way, every two element of the array are mixed up.

therefore mixed-up : $C_{16}^{2} = \frac{16!}{14!\,2!} = 120$

2. brutal force : $O(n^2)$. Two nested loop



4.

$T(n) = 2T(\frac{n}{2}) + cn$

$T(n) = 2^k T(\frac{n}{2^k}) + k \cdot c \cdot n$.

$\because n = 2^k$.

$T(2^k) = 2^k T(1) + k \cdot c \cdot 2^k$.

$T(2^k) = 2^k + k \cdot c \cdot 2^k$.

$\therefore k = \log_2 n$.

$T(n) = 2^{\log_2 n} + (\log_2 n) n \cdot c$

$T(n) = n + c \cdot n \cdot \log_2 n$.

$\therefore O(n \log n)$

$\therefore a = 2 \quad b = 2 \quad d = 1$.

$T(n) = O(n^d \log n)$ as $d = \log_b a$

$= O(n \log n)$