Problem 2 Analysis

Bubble Sort

```
bool swap;

do {
    swap = false;
    for(int i=0; i<n-1; i++) {
        if(a[i] > a[i+1]) {
            int temp = a[i];
            a[i] = a[i+1];
            a[i+1] = temp;
            temp = true;
        }
    }
} while (swap);
```

$$\Rightarrow O_b * \sum_{i=0}^{n-1} (CO_i + \sum_{i=0}^{n-2} (CO_i + PO_s))$$

$$\Rightarrow O_b + \sum_{i=0}^{n-1} (CO_i + (N-1)O_{is})$$

$$\Rightarrow O_b + (CO_i + O_{is}N - O_{is})(N-1-0+1)$$

$$\Rightarrow O_b + (CO_i + O_{is}N - O_{is})N$$

$$\Rightarrow O_b + (CO_i - O_{is})N + O_{is}N^2$$

$$\Rightarrow C_0 + C_1 N + C_2 N^2 \Rightarrow \boxed{F(N) \text{ is } O(N^2)}$$

Selection Sort

```
int alx, aih;
for (int pos = 0; pos < n-1; pos++) {        O(n)
    aih = a[pos]; indx = pos;
    for (int i = pos+1; i < n; i++) {
        if (a[i] < aih) {
            aih = a[i];                      O(1)
            indx = i;
        }
    }

    a[alx] = a[pos];
    a[pos] = aih;
}
```

$$\Rightarrow O_b + \sum_{k=0}^{n-2} (O_k + \sum_{i=k+1}^{n-1} (O_i + POS))$$

$$\Rightarrow O_b + \sum_{k=0}^{n-2} (O_k + O_{is}(N-k-1))$$

$$\Rightarrow O_b + \sum_{k=0}^{n-2} (O_k + O_{is}(N-1) - KO_{is})$$

$$\Rightarrow O_b + (N-1)(O_k + O_{is}(N-1)) - O_{is}\sum_{k=0}^{n-2} K$$

$$\Rightarrow O_b + (N-1)O_k + (N-1)^2 O_{is} - \frac{(N-2)(N-1)}{2} O_{is}$$

$$\Rightarrow (\tfrac{3}{2}O_{is})N^2 + (-\tfrac{7}{2}O_{is} + O_k)N + (2O_{is} - O_k + O_b)$$

$$\Rightarrow C_2 N^2 + C_1 N + C_0 \Rightarrow \boxed{F(n) = O(N^2)}$$