• Psuedo Code:-

Selection Sort (A)

```
1. for i=1 to A.length
2.     min-pos = i
3.     for J = i+1 to length of list
4.         If list [imin-pos ] > list [J]
5.             min-pos = J
6.     temp = list [i]
7.     List [i] = list [min-pos]
8.     list [min-pos] = temp
```

• Dry Running

A = [4, 3, 2, 1] → worst case

• 1st ITERATION OF FOR:-

```
1. i = 1
2. min-pos = 1
3. J = 2 → 1st iteration of for
4.     If 4 > 3
5.         min_pos = 2
```

2nd iteration of for 3. J = 3

```
4.     If 3 > 2
5.         min-pos = 3
```

3rd iteration of for

```
3. J = 4
4.     If 2 > 1
```

5. min-pos = 4

4th iteration of for

3. J=5
4. ——————
5. ——————

6. temp = 4
7. list [1] = 1
8. list [4] = 4 → A. [1, 3, 2, 4]

2ND ITERATION OF FOR:-

1. I = 2
2. min-pos = 2

1st iteration of for:-

3. J = 3
4. If 3 > 2
5. min-pos = 3

2nd iteration of for:-

3. J = 4
4. If 2 > 4
5. ——————

3rd iteration of for:-

3. J = 5
4. ——————
5. ——————
6. temp = 3
7. list [2] = 3
8. list [3] = 3 → A. [1, 2, 3, 4]

Teacher's Signature

3RD ITERATION OF FOR:-

1. i = 3
2. min-pos = 3

3. 1st iteration of for:- J = 4
4. if 3 > 4
5. _____

2nd iteration of for

3. J = 5
4. _____
5. _____

6. temp = 3
7. list[3] = 3 → A = [1, 2, 3, 4]
8. list[3] = 3

4TH ITERATION OF FOR

1. i = 4
2. min-pos = 4

1st iteration of for:-

3. J = 5
4. _____
5. _____
6. temp = 4
7. list[4] = 4 → A = [1, 2, 3, 4]
8. list[4] = 4

5TH ITERATION OF FOR:-

1. i = 5 → loop terminates

Line no.	Time/ instruction	frequency (Worst case)	(best case)
1	C	$n+1$	$n+1$
2	C	n	n
3	C	$\sum_{J=1}^{n} J \cdot \frac{n(n+1)}{2}$	$\sum_{J=1}^{n} J \cdot \frac{n(n+1)}{2}$
4	C	$\sum_{J=1}^{n} J-1 \cdot \frac{n(n-1)}{2}$	$\sum_{J=1}^{n} J-1 \cdot \frac{n(n-1)}{2}$
5	C	$\sum_{J=1}^{n} J-1 \cdot \frac{n(n-1)}{2}$	0
6	C	n	n
7	C	n	n
8	C	n	n

Worst case:

$$T(n) = C\left[n+1+n+\frac{n(n+1)}{2}+\frac{n(n-1)}{2}+\frac{n(n-1)}{2}+n+n+n\right]$$

$$T(n) = C\left[5n+1+\frac{n^2+n}{2}+\frac{n^2-n}{2}+\frac{n^2-n}{2}\right]$$

$$T(n) = C\left[\frac{10n+2+n^2+n+n^2-n+n^2-n}{2}\right]$$

$$T(n) = C\left[\frac{3n^2+9n+2}{2}\right]$$

$T(n) = K_1n^2 + K_2n + K_3$

• DISCUSSION:-

- selection sort in worst case grows quadratically.
- Worst case time complexity of selection sort is $O(n^2)$
- Means that, maximum time which a code can take.

(Best case):-

$$T(n) = \left[n+1+n+\frac{n(n+1)}{2}+\frac{n(n-1)}{2}+0+n+n+n\right]c$$

$$T(n) = \left[5n+1+\frac{n^2+n+n^2-n}{2}\right]c$$

$$T(n) = \left[\frac{10n+2+2n^2}{2}\right]c$$

$$T(n) = [K_1n^2 + K_2(n) + K_3]\,c$$

• DISCUSSION:-

- selection sort in best case grows quadratically
- best case time complexity of selection sort is $\Omega(n^2)$
- Means that, minimum time which a code can take