

King Fahd University of Petroleum and Minerals
 College of Computer Science and Engineering
 Information and Computer Science Department

ICS 353-03: Design and Analysis of Algorithms
 Spring 2006-2007
 Quiz#1, Monday February 26, 2007.

Name:

ID#:

Consider the modified selection sort algorithm shown below:

Algorithm modselectionsort

Input: An array $A[1..n]$ of n elements.

Output: $A[1..n]$ sorted in nondecreasing order.

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1. for  $i \leftarrow 1$  to  $n - 1$ 
2.   for  $j \leftarrow i + 1$  to  $n$ 
3.     if  $A[j] < A[i]$  then interchange  $A[i]$  and  $A[j]$ 
4.   end for
5. end for
    
```

1. (5 points) Apply the modified selection sort on the array 5, 3, 6, 2
2. (5 points) What is the minimum number of element assignments performed by Algorithm modselectionsort? When is this minimum achieved?
3. (10 points) What is the maximum number of element assignments performed by Algorithm modselectionsort? When is this maximum achieved?

Note that each interchange is implemented using three element assignments.

1-

	5	3	6	2	
	9	9			
	i	j			
	3	5	6	2	+2
			9		
	2	5	6	3	+1
			9		
			9		
	2	3	6	5	+1
	2	3	5	6	+1

2. \emptyset . $+2$ When the elts are sorted $+3$ since the condition in ~~line~~ line 3 will never be true, & hence no interchange will be carried out.

3. The maximum is achieved when the elts are sorted in decreasing order. $+3$

In this case:

In iteration $i=1$, we will have $n-1$ interchanges
 $\quad \quad \quad i=2, \quad \quad \quad n-2 \quad \quad \quad \leq$
 $\quad \quad \quad \vdots$
 $\quad \quad \quad i=n-1, \quad \quad \quad 1 \quad \quad \quad \text{interchange}$

$$\begin{aligned} \infty \text{ \# of interchanges} &= 1 + 2 + \dots + n-1 \quad +5 \\ &= \frac{(n-1)n}{2} \quad +1 \end{aligned}$$

$$\infty \text{ \# elt assignments} = \frac{3n(n-1)}{2} \quad +1$$