CS211 Concepts of Algorithms
Revision sheet: selection and insertion sort algorithms
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Solution

Question 1: Multiple-choice questions

Choose the correct answer.

1. **In the Insertion Sort algorithm, where is the element placed after each pass?**
   - A. At the start of the array
   - B. At the end of the array
   - C. At its correct position in the sorted subarray
   - D. In the middle of the array

2. **In Selection Sort, how many swaps occur in the worst case for an array of size n?**
   - **A. n - 1**
   - B. n
   - C. n/2
   - D. $O(n^2)$

3. **Which algorithm shifts elements rather than swapping them during sorting?**
   - A. Selection Sort
   - B. Insertion Sort
   - C. None of the above

4. **In Selection Sort, after k iterations, how many elements are sorted?**
   - A. k elements
   - B. k+1 elements
   - C. n-k elements
   - D. None of the above

5. **In Insertion Sort, what happens when the array is already sorted?**
   - A. It performs $O(n^2)$ operations.
   - B. It performs O(n) operations.

- C. It performs O(log n) operations.
- D. It does not perform any operations.

6. **In Selection Sort, what happens when the array is already sorted?**
   - A. It performs $O(n^2)$ operations.
   - B. It performs O(n) operations.
   - C. It performs O(log n) operations.
   - D. It does not perform any operations.
7. **What is the time complexity of Selection Sort in the worst case?**
   - A. O(n)
   - B. O(n log n)
   - C. $O(n^2)$
   - D. O(n!)

Question 2

Apply the *selection sort* on the following sequence:90, 100, 70, 30,99,1. In each pass give the number of comparisons.

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	Number of comparisons
90	100	70	30	99	1	5
1	100	70	30	99	90	4
1	30	70	100	99	90	3
1	30	70	100	99	90	2
1	30	70	90	99	100	1
1	30	70	90	99	100	sorted

Question 3

Apply the *Insertion sort* on the following sequence:80, 111, 68, 40,90,22. In each pass give the number of comparisons.

A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	Number of comparisons
80	**111**	**68**	**40**	**90**	**22**	**1**
80	**111**	**68**	**40**	**90**	**22**	**2**
68	**80**	**111**	**40**	**90**	**22**	**3**
40	**68**	**80**	**111**	**90**	**22**	**2**
40	**68**	**80**	**90**	**111**	**22**	**5**
22	**40**	**68**	**80**	**90**	**111**	**sorted**