CSE 373 Lecture 19 Worksheet

Name & UW NetID:

1. Consider three sorting algorithms.
   - Algo A: requires only 1 additional memory location to store a temp variable,
   - Algo B: requires 100 additional memory locations as its axillary storage, and
   - Algo C: requires additional memory that is equivalent to $(1/100)^{th}$ times the input size n.

   Which of the following statements are true? (select all that apply):
   A. Algo A is an in-place and stable sorting algorithm
   B. Algo B is an in-place sorting algorithm
   C. Algo C is an in-place
2. Consider the following four sorting algorithms and their properties.
   - Algo A: Worst-case $O(n^2)$, average-case $O(n \log n)$, space: $O(1)$ stable, not in-place.
   - Algo B: Worst-case $O(n \log n)$, average-case $O(n \log n)$, not-stable, in-place.
   - Algo C: Worst-case $O(n^2)$, average-case $O(n^2)$, stable, in-place.
   - Algo D: Worst-case $O(n^2)$, average-case $O(n \log n)$, not-stable, not in-place.

   Given the same input to all these four algorithms, output of _____algorithms would be the same. (select all that apply from the choices below)
   A. A, B, C, and D (all are sorting algorithms after all!)
   B. B, C
   C. A, D
   D. A, C
   E. Other
3. Following pseudocode is of an insertion sort.

```
1:  function insertionSort(A)
2:      for i = 1 to A.length − 1 do
3:          for j = i − 1 to 0 do
4:              if A[j] < A[i] then
5:                  temp = A[i]
6:                  Shift elements j + 1 . . . i − 1 right by 1
7:                  A[j + 1] = temp
8:                  break
9:              end if
10:         end for
11:     end for
12: end function
```

change if condition to $A[j] \leq A[i]$

Would the sorted output of the above code stable? If not, identify the line of code that makes it unstable and briefly describe how you would fix it.

No

4. Answer the following questions about the following graph

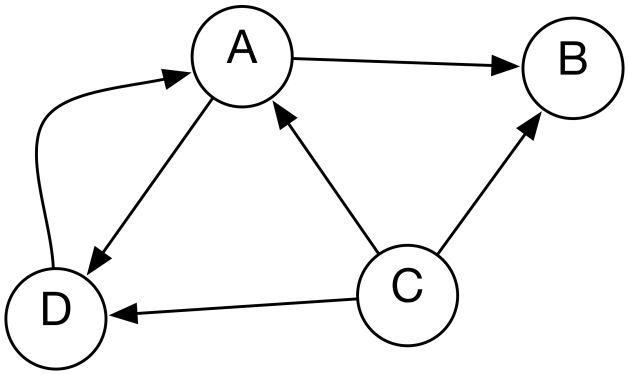

Figure 1: A simple graph

i. What type of graph is this (directed or undirected): directed

ii. Write the vertex and edge sets for this graph:

$V = \{A, B, C, D\}$

$E = \{(A,B), (A,D), (D,A), (C,D), (C,A), (C,B)\}$

iii. What is the degree of the node A? 4

iv. What is the in-degree of the node D? 2

v. What is the out-degree of the node C? 3

vi. What is the in-degree of the node C? 0

vii. Write the path (if any) from node D to B: D A B

viii. Write the path (if any) from node D to C: No path