CCS 4201: DATA STRUCTURES & ALGORITHMS- CAT ONE hand in two weeks’ time

1. Consider a situation where swap operation is very costly. Suggest a sorting algorithm that would be preferred so that the number of swap operations are minimized in general, hence justify your suggestion. [2marks]
2. Differentiate between a recursion and an iteration in program development. Use a high level language example to explain the difference, hence explain why the recursive algorithm uses more memory than the iterative algorithm. [6marks]
3. Provide an algorithm to be used to traverse the linked list [4marks]
4. Provide an algorithm that inserts **a node** at the beginning of the List [4marks]
5. **Justify any two drawbacks of the linked list Data Structure [2marks]**
6. Provide any two scenarios where Linked list would be used as a Data Structure of choice. [2marks]
7. Define a Stack, hence provide an algorithm for the Push () and Pop () operations. [4marks]

**CAT TWO** hand in two weeks’ time

1. Suppose we have an array implementation of the stack with ten items in the stack stored at data [0] through data [9]. The SIZE is 42. Where does the push function place the new entry in the array, justify your answer. [2marks]
2. Below is a pseudocode that uses a stack.

*Declare a stack of characters;*

*while (there are more characters in the word to read)*

*{*

*read a character;*

*push the character on the stack;*

*}*

*while (the stack is not empty)*

*{*

*pop a character off the stack;*

*write the character to the screen;*

*}*

Give the output for input “**War*”*** for the given pseudocode, justify your answer [2marks]

1. Provide an algorithm for the insertion sort. [6marks]
2. In terms of sorting algorithms what do we mean when we say the algorithm is a stable sort, Support your answer with an example*.* [2 marks]
3. **Demonstrate your understanding when we say that an algorithm X is asymptotically more efficient than Y. [2marks]**
4. Write a pseudo code algorithm that prompts the user for three integers, evaluates the largest and print’s the maximum, hence implement the algorithm into a program using a high level language of your choice [4 marks]
5. Consider the following code segment

Arr [4] = {6,4,3,1}

j = 0 , k = 10

While (j < 4) do

If (arr [j] < k) then

k =arr [j]

Endif

j = j+1

End while

Display k.

1. What does the code display, dry run to show your answer [4 marks]
2. Using a high level language, Implement the algorithm in to a program [4marks]

(d) Write an algorithm / procedure for deleting a node from a queue. [4marks]