Tutorial-1

1. Calculate the big-O notation for the following:

   a) $5n^{5/2} + n^{2/5}$

   b) $6 \log_2 n + 9n$

   c) $3n^4 + n \log_2 n$

   d) $5n^2 + n^{3/2}$

2. If the algorithm doIt() has the complexity $5n$, Calculate the run time complexity of the following program segment

```
i = 1
loop i <= n
    doIt(...)
    i = i+1
```

3. Suppose the complexity of an algorithm is $5n \log_5 n$. If a step in the algorithm takes 1 nanosecond, how long does it take for the algorithm to process an input size of 1000?

4. Three students wrote algorithms for the same problem. They tested the three algorithms with two sets of data as shown below:

   a) Case 1: n = 10
   runtime for student 1 = 1
   runtime for student 2 = 1/100
   runtime for student 3 = 1/1000

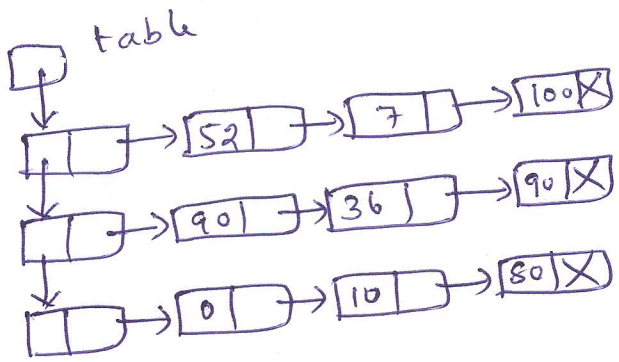
   b) case 2: n = 100
   runtime for student 1 : 10
   runtime for student 2 : 1
   runtime for student 3 : 1

What is the time complexity of each algorithm? Which is the best? Which is the worst?

5. Write an algorithm, that traverses a linked list and returns the data in the node with the minimum key value.

6. Write an algorithm that traverses a linked list and deletes the nodes following a node with a negative key.

7. Write a program that creates a two-dimensional linked list. The nodes in the first column contain only two pointers. The left pointer points to the next row, the right pointer points to the data in the row.



In this 2-D list, search whether a particular number is present

8. Write an algorithm to merge two ordered linked lists to create another ordered linked list.

9. Write an algorithm to delete all the nodes with a duplicate key.

10. Write an algorithm to read a list of numbers and each time a negative number is read, print the 5 numbers that come before the negative number and then discard the negative number.

(11) Write a function called copystack that copies the contents of one stack into another. The function must have two arguments of type stack one for the source stack and one for the destination stack. The order of the stacks must be identical

(12) Write the pseudocode for an algorithm that reverses the contents of a stack (the top and bottom elements exchange positions, the second and the element just before the bottom exchange positions and so forth until the entire stack is reversed)

(13) Write an algorithm using a queue, to compress a string by deleting all space characters in the string

(14) Using only the algorithms in the queue ADT, write an algorithm called catQueue that concatenates two queues together. The second queue is to be put at the end of the first queue

(15) What would be the contents of queue Q1 after the following code is executed?

data in the file: 5, 7, 12, 4, 0, 4, 6, 8, 67, 34, 23, 5, 0, 44, 33, 22, 6, 0

```
1 Q1 = CreateQueue
2 S1 = CreateStack
3 loop(not end of file)
   1 read number
   2 if (number != 0)
      1 push(S1, number)
   3 else
      1 pop(S1, x)
      2 pop(S1, x)
      3 loop(not empty S1)
         1 pop(S1, x)  2 enqueue(Q1, x)
```