Practice Question SET-1
Algorithm Design 1

**NB: The yellow shaded options are the answers.

Q1.
What is the time complexity of fun()?

```
int fun(int n)
{
  int count = 0;
  for (int i = 0; i < n; i++)
     for (int j = i; j > 0; j--)
        count = count + 1;
  return count;
}
```

A. θ (n^2)
B. θ (nLogn)
C. θ (n)
D. θ (n.Logn.Logn)

Q2.

Consider the following three claims

I. $(n + k)^m = \theta (n^m)$, where k and m are constants

II. $2^{(n + 1)} = 0(2^n)$

III. $2^{(2n + 1)} = 0(2^n)$

Which of these claims are correct?

A. I and II

B. I and III

C. II and III

D. I, II and III

Q3.
Heap sort is found to be very efficient

A. in time consumption

B. with regard to storage requirement

C. regarding overheads involved

D. None of the above

Q4.

What is the number of edges present in a complete graph having n vertices?
a) (n*(n+1))/2
b) (n*(n-1))/2
c) n
d) Information given is insufficient

Q5.

Depth First Search is equivalent to which of the traversal in the Binary Trees?
a) Pre-order Traversal
b) Post-order Traversal
c) Level-order Traversal
d) In-order Traversal

Q6.

Which of the following is the most commonly used data structure for implementing Dijkstra's Algorithm?
a) Max priority queue
b) Stack
c) Circular queue
d) Min priority queue

Q7.
In a competition, four different functions are observed. All the functions use a single for loop and within the for loop, same set of statements are executed. If **n** is the size of input(positive), which function is most efficient(if the task to be performed is not an issue)?
A) for(i = 0; i < n; i++)
B) for(i = 0; i < n; i += 2)
C) for(i = 1; i < n; i *= 2)
D) for(i = n; i > -1; i /= 2)

Q8.
A sorting technique is called stable if:

A) It takes O(nlog n)time

B) It maintains the relative order of occurrence of non-distinct elements

C)It uses divide and conquer paradigm
D)It takes O(n) space

Q9.

What is the time complexity of fun()?

```
int fun(int n)
{
  int count = 0;
  for (int i = 0; i < n; i++)
     for (int j = i; j > 0; j--)
        count = count + 1;
  return count;
}
```

(A) Θ (n)
(B) Θ (n^2)
(C) Θ (n*logn)
(D) Θ (n*logn*logn)

Q.10.

Which of the following is not O (n^2) ?

A . (15^{10}) * n + 12099
B. $n^{1.98}$
C. n^3 / (sqrt(n))
D. (2^{20}) * n

Q.11.
Which of the given options provides the increasing order of asymptotic complexity of functions f1, f2, f3 and f4?

f1(n) = 2^n

f2(n) = $n^{(3/2)}$

f3(n) = n.logn

f4(n) = $n^{(logn)}$

A. f3, f2,f4,f1
B. f3, f2, f1, f4
C. f2, f3, f1, f4
D. f2, f3, f4, f1

Q. 12.
Heap is defined to be a

A. complete binary tree

B. binary tree

C. tree structure

D. None of the above

Q.13.

Which of the following is an advantage of adjacency list representation over adjacency matrix representation of a graph?

(A) In adjacency list representation, space is saved for sparse graphs.

(B) DFS and BSF can be done in O(V + E) time for adjacency list representation. These operations take O(V^2) time in adjacency matrix representation.

(C) Adding a vertex in adjacency list representation is easier than adjacency matrix representation.

(D) All of the above

Q.14.

The most efficient algorithm for finding the number of connected components in an undirected graph on n vertices and m edges has time complexity.

(A) Θ (n)

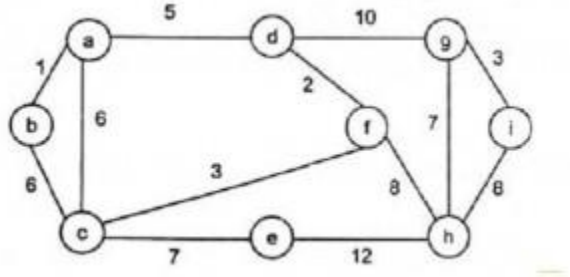
(B) Θ (m)

(C) Θ (m + n)

(D) Θ(m*n)

Q.15.

For the undirected, weighted graph given below, which of the following sequences of edges represents a correct execution of Prim's algorithm to construct a Minimum Spanning Tree?



(A) (a, b), (d, f), (f, c), (g, i), (d, a), (g, h), (c, e), (f, h)

(B) (c, e), (c, f), (f, d), (d, a), (a, b), (g, h), (h, f), (g, i)

(C) (d, f), (f, c), (d, a), (a, b), (c, e), (f, h), (g, h), (g, i)

(D) (h, g), (g, i), (h, f), (f, c), (f, d), (d, a), (a, b), (c, e)

Q.16.

What is the maximum number of edges in an acyclic undirected graph with n vertices?

(A) n-1

(B) n

(C) n + 1

(D) 2n-1

Q.17.

Given pseudo code of Dijkstra's Algorithm.

```
1. //Initialise single source(G,s)
2. S=0
3. Q=V[G]
4. While Q != 0
5.          Do u=extract-min(Q)
6.                    S=S union {u}
7.                    For each vertex v in adj[u]
8.                              Do relax(u,v,w)
```

What happens when while loop in line 4 is changed to while Q>1?

a) While loop gets executed for v times

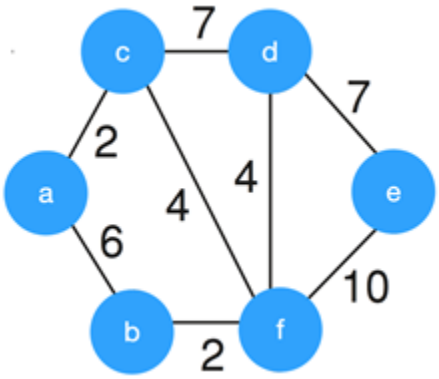
b) While loop gets executed for v-1 times

c) While loop gets executed only once

d) While loop does not get executed

Q.18.

Consider the given graph.



What is the weight of the minimum spanning tree using the Kruskal's algorithm?

a) 24

b) 23

c) 15
d) 19

Q.19.

Which statement(s) is/are true for the graph G.?

a) If G has a topological ordering, then G is a DAG (directed acyclic graph).

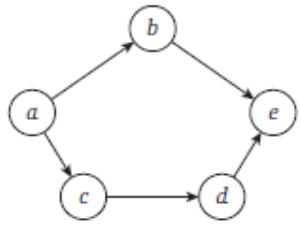
b) If G is a DAG (directed acyclic graph), then G has a topological ordering.

c) Both (a) and (b)

d) None of the above

Q.20.

How many topological orderings does this graph have?



a) 2
b) 3
c) 1
d) 0

*****Best of Luck*****