Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Winter 2019 - 20 Examination

Semester: 5 **Date: 26/11/2019**
Subject Code: 03105302 **Time: 10:30am to 01:00pm**
Subject Name: Design and Analysis of Algorithm **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions **(15)**

1. The _____ complexity of an algorithm is the amount of computer time it needs to run to completion.
2. An _____ is a finite set of instructions that, if followed, accomplishes a particular task.
3. The upper bound in algorithmic complexity is also known as _____ complexity.
4. f1(n) =n!, f2(n) = $n^{3/2}$, f3(n) = $nlogn$, f4(n) = n^{logn}
   arrange these functions in ascending order of growth rate _____.
5. A feasible solution either maximizes or minimizes the given objective function is called as _____ solution
6. The running time of matching function in KMP string matching algorithm is
   (a) Θ(n) (b) Θ(n^2) (c) Θ(n/2) (d) Θ(n^3)
7. The time complexity of the normal quick sort, randomized quick sort algorithms in the worst case is
   (a) O(n^2), O(n log n) (b) O(n^2), O(n^2)
   (c) O(n log n), O(n^2) (d) O(n log n), O(n log n)
8. void function (int n)
```
{
  for(int i=0; i<9999; i++)
  {
    printf("Hello World!");
  }
}
```
   (a) $O(n)$ (b) $O(logn)$ (c) $O(1)$ (d) $O(nlogn)$
9. The Sorting method which is not used for external sort is
   (a)Bubble sort (b) Selection sort (c) Quick sort (d) All
10. void function (int n)
```
{
  for(int i=1;i<n;i=i*2)
  {
    printf("Hello World!");
  }
}
```
   (a) $O(n)$ (b) $O(logn)$ (c) $O(1)$ (d) $O(nlogn)$

11. void function(int n)

```
{
    int n = 2^(2^k);
  for(int i=1;i<=n;i++)
  {
    j=2;
    while(j<=n)
    {
        j = j*j;
       printf("DAA"):
     }
   }
}
```

(a) $O(n)$ (b) $O(nloglogn)$ (c) $O(1)$ (d) $O(nlogn)$

12. What do you call the selected keys in the quick sort method?
(a)Outer key (b) Inner Key (c) Partition key (d) Pivot key

13. void function (int n)

```
{
  for (int i=1;i*i<n;i++)
  {
    printf("PU");
   }
}
```

(a) $O(\sqrt{n})$ (b) $O(logn)$ (c) $O(1)$ (d) $O(nlogn)$

14. _____is the first step in solving the problem

(a) Understanding the Problem (b) Identify the Problem

(c) Evaluate the Solution (d) None of these

15. Examples of $O(n^2)$ algorithms are_____.

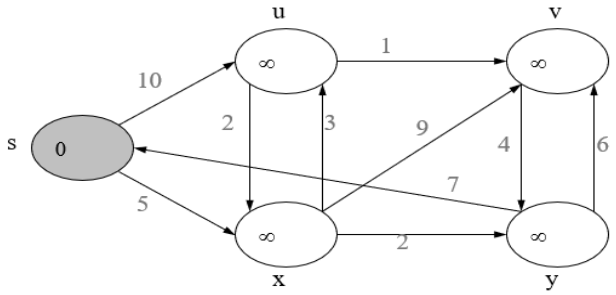
(a) Adding of two Matrices (b) Initializing all elements of matrix by zero

(c) Both (a) and (b) (d) None of these

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) List out shortest path problems. What do you mean by "relaxation"?

B) Apply Dijkstra's algorithm in the follow graph. Write each step to get the final answer, consider "s" as starting node.

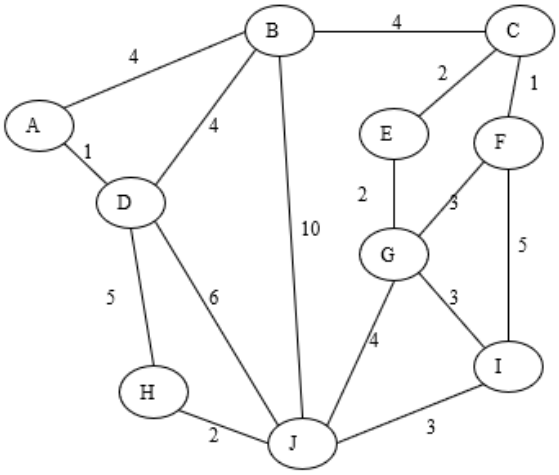


C)

Jobs	J_1	J_2	J_3	J_4	J_5	J_6	J_7
Start time	0	3	4	9	7	1	6
Finish time	2	7	7	11	10	5	8

Above are the details of various jobs to be scheduled on multiple processors such that no two processes execute at the same on the same processor. Show schedule of these jobs on minimum number of processors using greedy approach.

D) Write each step to solve minimum spanning tree problem using Prim's algorithm for the following complete graph.



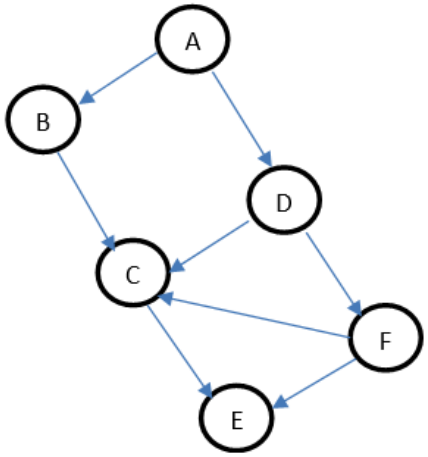
Q.3 A) **(07)**

	Worst Case time Complexity
Bubble sort	
Searching element in unsorted array	
Tower of Hanoi	
Searching element in sorted array	
Heap sort	
Quick sort with sorted elements	
Counting sort	

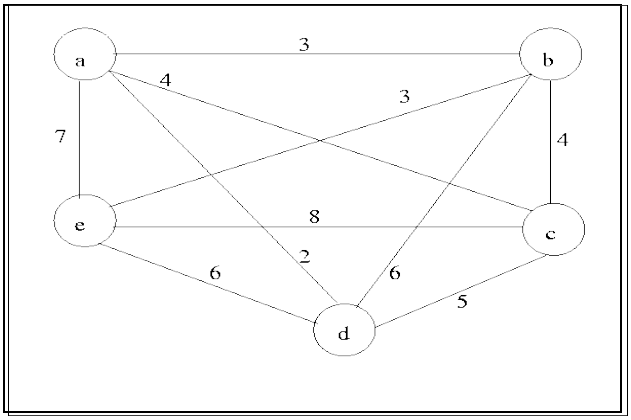
B) Explain multiplying large integers problem. Write each step to show how multiplication will be reduced for the given two numbers A = 2135 and B = 4014 using divide and conquer algorithm. **(08)**

OR

B) Apply Topological sort on the following DAG. **(08)**



Q.4 A) Solve the travelling salesman problem using branch and bound algorithm for the given graph below. **(07)**



OR

A) We have a knapsack with max weight capacity W = 5. Fill the knapsack with items such that the benefit (value or profit) is maximum using dynamic programming technique with the following table data which contains the items along with their value and weight. **(07)**

Item (i)	1	2	3	4
value (v)	100	20	60	40
weight(w)	3	2	4	1

B) What is P vs NP problem? Justify your answer, include definitions of P and NP class. **(08)**