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Department of Computer Science and Engineering
B. Sc. (Engineering) in Computer Science and Engineering
Semester Final (Online) Examination 2019(Jul-Dec)
Level **2**, Semester **II**, Course Code: **CSE 255**, Credit: **3.0**
Course Title: **Algorithms Analysis and Design**

Time: **1** hour **30** Minutes Total Marks: **90**

[N.B. The figure in the right margin indicates the marks allocated for respective question. Split answer of any question is not allowed.]

Section-A

*Answer any **03(three)** from the following questions (1-4)*

1. a) Define Algorithm. How can an algorithm be devised? 2+5

   b) To develop a new algorithm, space and time complexity of the existing algorithms are required to calculate with a view to measuring their performance. To do so, calculate the run-time complexity and represent in any asymptotic notation of the following algorithm ***Sum_of_Series()***, written using pseudocode convention. 8

```
Sum_of_Series(A, n)
{
    if (n<=0) then return 0.0;
    n=n/2;
    else return  Sum_of_Series(A, n-1)+A[n];
}
```

2. a) What is comparison sort? Explain the decision tree model for any comparison sort operation. 7

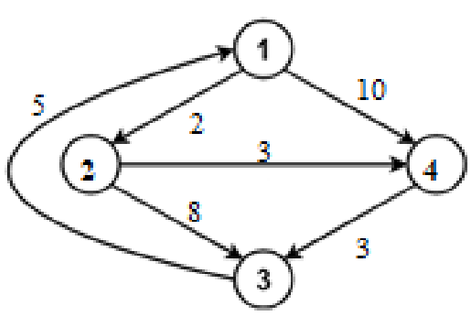
   b) Apply **counting** sort algorithm to sort the array of integers: 4,1,5,2,0,2,3,7,8, and 6. 8

3 a) Explain the general divide-and-conquer method. 4

b) Explain the steps to develop an algorithm with a view to finding a longest common subsequence (LCS) from the any two strings such as X= (1, 0, 1, 1, 0) and Y= (0, 1, 0, 1, 1, 0) using dynamic programming technique. 11

4. a) Write a suitable algorithms either in pseudocode or in flowchart for finding the greatest common divisor (GCD) of two integers using Euclidean algorithm. 4

   b) Considering the following graph find the shortest-path for all pairs of vertices using **Floyd-Warshall** algorithm derived from the dynamic programming concept. 11



Section-B

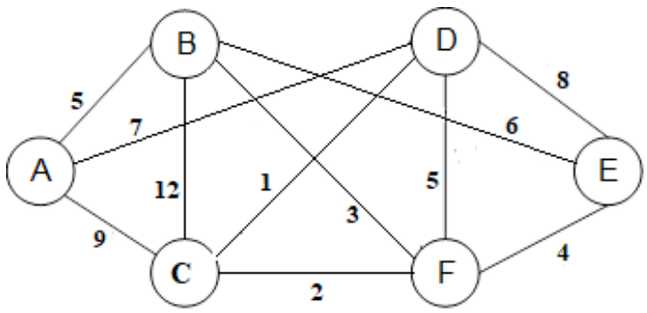
*Answer any **03(three)** from the following questions (5-8)*

5. a) Briefly explain NP-complete problem classes. 3

   b) To solve a typical problem using computer-programming, a sequence of **8** integers i.e., 12, 7, 3, 9, 5, 8, 21, 11 is needed to sort efficiently. Since you know the various sorting algorithms with their comparative performance, your task is to sort the sequence using **quick sort** algorithm. 12

6. a) Explain in brief the necessity of minimum spanning tree (MST). 3

   b) Find the MST of the following graph using Prims or Kruskal's algorithm. {Take vertex '**A**' as initial vertex if needed.} 12



7. a) Compare between dynamic programming technique and greedy algorithm technique to solve an optimization problem. You can assume the activity selection problem for your convenience to write the answer. 7

   b) Consider the 4-queens problem which is one of the constraint satisfaction problems. Apply backtracking approach to solve the problem considering the given initial placement of the first queen on the 4×4 queen board. 8

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8. a) Define the principle of optimality. Prove that the run-time complexity for best, worst and average case of merge sort algorithm is O(n lg n), where n is the number of elements to be sorted. 2+5

   b) Explain the properties of **Bellman-Ford** and **Dijkstra's** algorithm to solve the shortest path problems 4+4