**United College of Engineering and Research, Allahabad**

**Department of Computer Science & Information Technology**

**IIIrd Sessional Examination (2018-19)**

**B.Tech. (Vth Semester (CS & IT))**

**Design and Analysis of Algorithm**

**Subject Code: RCS-502**

**Time:** 2.00 hours **Max. Marks:** 30

**Note:** There are three sections in this paper. All sections are compulsory.

**Section-A**

**Note:** All questions are **compulsory**. Each question has equal marks. **10\*1=10**

1. Define B-Tree.
2. Define Heap data structure.
3. Write name of three stable sort algorithms.
4. Explain the N-Queen problem.
5. Define θ-notation function.
6. Define NP-complete problem.
7. 



**Common data for questions: 9 & 10**

1. 
2. 

**Section-B**

**Note:** Attempt any **six** questions. Each question has equal marks. **6\*2=12**

1. Solve the following recurrence relation:-

**T(n) = 5T(n/5) + n/lgn**

1. Create B-Tree for the following elements with minimum degree **t= 2** :-

**15, 7, 20, 5, 18, 10, 12, 77, 65, 58, 39, 47, 50, 8, 17.**

1. Write an algorithm for finding a node with minimum key in Binomial heap.
2. Write an algorithm of counting sort.
3. Write an algorithm of Heap sort.
4. Apply the Dijkstra’s algorithm in the following graph:

**Source Vertex: A**

2

5

4

3

5

3

4

2

1. Write the algorithm for Hamiltonian cycle problem.
2. Solve the LCS problem using dynamic programming for the following data:-

**Sequence1= <G, X, T, X, A, Y, B> Sequence2= <A, G, G, T, A, A,B>**

**Section-C**

**Note:** Attempt any **two** questions. Each question has equal marks. **2\*4=8**

1. Create a **RED-BLACK** tree for the following elements:-

**15, 7, 20, 5, 18, 10, 12, 77, 65, 58, 39, 47, 50, 8, 17.**

Initially RED-BLACK tree is empty.

1. Write **Knuth-Morris-Pratt(KMP)** string matching algorithm.
2. What are the fields of a node in Fibonacci heap? Write the algorithm for decreasing the key of a node in to the Fibonacci heap. Determine the amortized cost for the above algorithm.