

**III/IV B.Tech. DEGREE EXAMINATIONS, NOVEMBER- 2019**

**First Semester**

**COMPUTER SCIENCE ENGINEERING**

**ADVANCED DATA STRUCTURES AND ALGORITHMS**

**Time: Three Hours**

**Maximum marks:60**

**Answer Question No.1 Compulsory**

**6X2=12 M**

**Answer ONE Question from each Unit**

**4X12=48 M**

1. a) Big O notation
- b) Give the properties of binomial heaps
- c) What is a height balanced tree?
- d) Define and give an example of a Minimum Cost Spanning Tree.
- e) Dynamic programming
- f) Brief on NP-complete decision problem

**UNIT-I**

2. a) Consider the given values 72, 27, 36, 24, 63, 81, 92, 101 and perform linear, quadratic probing operations in a given hash table of size 10.
- b) Explain Solving by unrolling and Solving by guess and inductive proof with suitable examples.

**(OR)**

3. a) Explain Recursion-tree method and how a recursion tree models the costs (time) of a recursive execution of an algorithm.
- b) With example, explain modulo division and digit extraction hashing methods

**UNIT-II**

4. a) What are the operations that are supported by a splay tree? Explain.
- b) Give amortized analysis of splay trees.

**P.T.O**

**(OR)**

5. a) Give a brief on Binomial heaps and Fibonacci heaps. Explain how they differ with suitable example.
- b) What is a minimum spanning tree? Explain with an example, Krushkal's algorithm for constructing minimum cost spanning tree.

### **UNIT-III**

6. a) Explain Critical Operations for Abstract Explicit Partitions
- b) Give the path-compression Find operation and explain how it is implemented.

**(OR)**

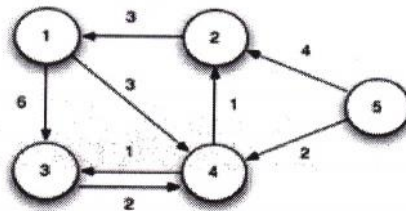
7. Explain Prim's algorithm as a greedy algorithm that finds a minimum spanning tree for a weighted undirected graph. Can Prim's algorithm have cycles? Explain.

### **UNIT-IV**

8. Write a brief on Bipartite Matching and Maximum Bipartite Matching. Explain Ford-Fulkerson algorithm that can find a maximum matching in a bipartite graph in  $O(mn)$  time.

**(OR)**

9. Give a Bellman-Ford Algorithm. Find the shortest paths from Vertex 5 to other vertices in the following graph.



**III/IV B.Tech. (Supple) DEGREE EXAMINATIONS, JUNE- 2019****First Semester****COMPUTER SCIENCE ENGINEERING****ADVANCED DATA STRUCTURES AND ALGORITHMS****Time: Three Hours****Maximum marks:60****Answer Question No.1 Compulsory****6X2=12 M****Answer ONE Question from each Unit****4X12=48 M**

1.
  - a) Omega notation
  - b) Open Addressing hashing
  - c) Properties of depth-first search and what information it yields about the structure of a graph
  - d) Significance of priorities in arranging elements in a priority queue.
  - e) NP-complete problem with an example
  - f) Union by rank heuristic.

**UNIT-I**

2.
  - a) What is hashing? Why do we need hashing and explain the importance of hashing with an example.
  - b) What are the advantages of Linear Probing? Explain with suitable example.

**(OR)**

3. Explain substitution method for solving recurrences and give an example for the same.

**UNIT-II**

4.
  - a) Define binomial heap. Explain its characteristic features.
  - b) Suppose that a binomial heap H has a total of n nodes. Discuss the relationship between the binomial trees that H contains and the binary representation of n. Conclude that H consists of at most  $\lceil \lg n \rceil + 1$  binomial trees.

(OR)

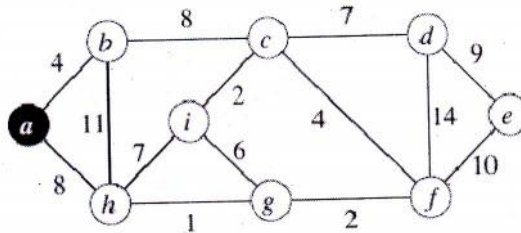
5. Define B Tree and explain basic operations on B-Tree with suitable example for each.

### UNIT-III

6. Explain the Heuristics to improve the running time. Write a nonrecursive version of FIND-SET with path compression.

(OR)

7. Explain Prim's algorithm as a special case of the generic minimum-spanning-tree method and show its execution on the following graph.



### UNIT-IV

8. a) Explain maximum-bipartite-matching problem and explain how Ford-Fulkerson method can be used to find a maximum matching in an undirected bipartite graph  $G=(V,E)$  in time polynomial in  $|V|$  and  $|E|$ .
- b) "The max-flow min-cut theorem tells us that a flow is maximum if and only if its residual network contains no augmenting path". Explain and prove the same.

(OR)

9. Define flow network and give an example. Give Ford-Fulkerson method for solving the maximum-flow problem and explain with an example.

