

## **ADS PYQ[2020,21,22,23]**

### **MODULE 1**

(3-mark)

1. Define BST
2. What are disjoint sets? Explain with an example.
3. Distinguish b/w linear and non-linear data structure.
4. Explain 2 collision resolution methods in hashing.
5. Differentiate b/w stack and queue.
6. What is a set data structure? How is a set implemented using a bit string?
7. What is meant by hash collision?
8. Explain set implementation using bit strings. Give an example.

(6-mark)

1. What is hashing? Explain the different hash functions.
2. Explain amortised analysis using the accounting method.
3. How do you perform amortized analysis using the aggregate method? Illustrate with the example of incrementing a binary counter.
4. Explain disjoint set data structure. What are the operations performed on disjoint set data structure.
5. How do you perform amortized analysis using the accounting method? Illustrate with the example of incrementing a binary counter.
6. What are the collision resolution techniques in hashing? Explain one of them.
7. Write in detail on the operations of disjoint sets.
8. Explain amortized analysis using the aggregate method. Illustrate using a multipop stack example.

### **MODULE 2**

(3-mark)

1. What is a splay tree? List the rotations in a splay tree.
2. Explain the concept of a suffix tree with a suitable example.
3. What is a splay tree? What are the advantages of splay trees?
4. Explain characteristics of a balanced binary search tree.
5. State the properties of a red black tree.
6. What is a balanced binary search tree? Give an example.

(6-mark)

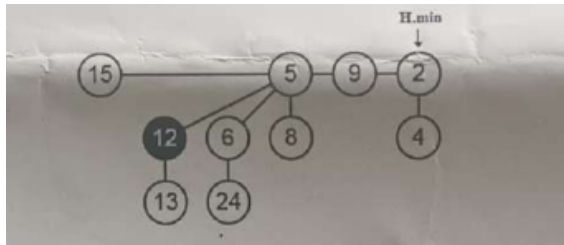
1. Explain red black tree insertion operations with examples.
2. What is a B tree? Explain B tree operations.
3. Construct a red black tree by inserting the keys in the following sequence into an initially empty red black tree: 13, 10, 8, 3, 4 and 9. Show each step.
4. Describe a B tree. How can we insert a key into a B tree?
5. How is a full node splitted in a B tree insertion procedure? Explain with a diagram.
6. What is a B tree? State its various properties. Explain the insertion operation in a B tree.
7. What is a red black tree? State its various properties. Explain the rotation operations in a red black tree.

### **MODULE 3**

(3-mark)

1. What is the difference b/w min heap and max heap?

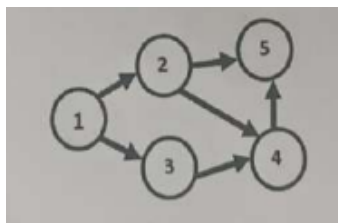
2. What is mergeable heap?
3. A binomial heap has 4 binomial trees. Their degrees are 0, 1, 2 and 4. After you add an entry how many binomial trees will the heap have? What are degrees of the trees?
4. Explain the characteristics of fibonacci heap.
5. List out 3 operations supported by a mergeable heap.
6. Find the potential of the fibonacci heap given below



7. What is a binomial heap? Give an example.
8. List out 3 operations of fibonacci heaps. (6-mark)
  1. Describe binomial heap with example.
  2. Explain fibonacci heap operations with example.
  3. a) Draw a binomial heap whose keys are 6, 3, 5, 18, 1, 10, 7, 9, 16, 10, 20.  
b) Explain how union operation is performed in a binomial heap.
  4. Describe extract min operation in fibonacci heap with the help of an example. What is the amortized cost of the operation?
  5. Explain how decrease key operation is performed on binomial heaps. What is the amortized cost of this operation?
  6. How delete key operation is performed on binomial heap? Give an example.
  7. How delete key operation is performed on fibonacci heap? Give an example.

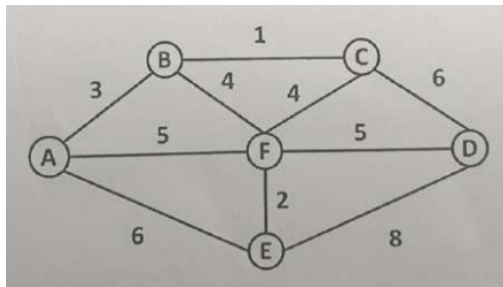
#### **MODULE 4**

- (3-mark)
1. Describe adjacency matrix representation of a graph.
  2. What are strongly connected components in a graph? Explain with an example.
  3. Compare and contrast BFS and DFS.
  4. What is topological sort in a graph?
  5. What is meant by bi-connected components? Illustrate with an example.
  6. Write the topological ordering of the graph.



7. What is minimum cost spanning tree? Give an example.
8. Write down Prim's algorithm. (6-mark)
  1. Explain Prim's algorithm with an example.
  2. Describe Dijkstra's single source shortest paths algorithm with an example.
  3. What is a minimum cost spanning tree? Explain Kruskal's algorithm to find minimum cost spanning tree with an example.

4. Explain strongly connected components. How can you find strongly connected components of a graph.
5. Explain DFS algorithm with a suitable example.
6. Apply Kruskal's algorithm to find a minimum spanning tree of the following graph.



## **MODULE 5**

(3-mark)

1. What is block chain data structure?
2. What is smart contract in block chain?
3. Explain transaction model in block chain technology.
4. Explain block chaining with an example.
5. What is merkle tree? Give example.
6. Explain on any 3 problems to be solved in blockchain data analysis.
7. What is contract data?

(6-mark)

1. Explain about blockchain architecture in detail with a neat diagram.
2. What are the advantages and disadvantages of blockchain?
3. Explain data structure and data types in block chain technology.