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S.E.(Computer) (Sem-IV) (Revised Course 2016-2017)
EXAMINATION MAY/JUNE 2019
Data Structures and Algorithms - II

[Duration : 3 Hours]

[Max. Marks : 100]

Instructions:

1. Answer **any two** question from Part-A
2. Answer **any two** question from Part-B
3. Answer **any two** question from Part-C
4. Assume the necessary data.

Part A

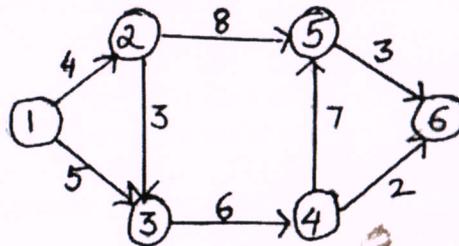
- Q.1
- a) Prove the following with respect to Binary Tree 04
 - i) The maximum number of nodes possible in a Binary Tree of height h is $2^h - 1$.
 - ii) A strictly Binary Tree with n non leaf nodes has $n+1$ leaf nodes.
 - b) Explain the various cases of deletion of the node from the in-Threaded Binary Tree. 08
 - c) Construct the B-Tree of order 5, by inserting the following key values sequentially 08
May Jun Jul Apr Aug Sep Oct Jan Nov Feb Mar Dec
- Q.2
- a) Given the postorder traversal of the Binary Search Tree 10 14 26 40 48 44 38 25. 04
Construct the binary Search Tree. Find the height of the tree, preorder traversal and level order traversal.
 - b) Explain the different cases of insertion of the node P in the right subtree in a Red Black Tree. 08
 - c) Explain the deletion of a key from the leaf and non-leaf node in a B-Tree of order m . 08
- Q.3
- a) Write the C functions to delete the maximum element from the Max -Heap data structure. 04
 - b) Perform the following operations on a B+Tree of order 5. 08
Insertion: 77 22 55 99 78 55 53 84 18 45
Deletion: 77 18 55
 - c) Explain the different cases of insertion of a node in the right subtree in an AVL Tree. 08

Part B

- Q.4
- a) Perform the Heap Sort on the following data, 23 34 12, 11 18 in the ascending order. 05
 - b) Explain the following with the help of graph example 04
 - i) Connected components
 - ii) Biconnected components
 - c) Suppose we have 144K of free memory and the smallest block of memory that can be 05

allocated is of size 8K. Use the Fibonacci Buddy System to allocate 20K for P1, 30K for P2, 15K for P3, 35K for P4.

- d) Explain the implementation of Prim's Algorithm, to find the minimum cost spanning tree. **06**
- Q.5 a) Explain the Modified Warshall's Algorithm, to find the all pairs shortest path. **06**
 b) Compare the First Fit, the Best Fit and the Worst Fit sequential fit methods with an example. **06**
 c) Construct the Huffman Tree, for the message **aaabbcdeefghii** and show how encoding is done using the Huffman tree. **05**
 d) Explain the Topological Sorting Algorithm with an example. **03**
- Q.6 a) Explain the terms adjacency matrix and adjacency list of a graph. **02**
 b) Explain the implementation of Depth First Search using a data structure, for an undirected graph having 7 vertices and 12 edges. **08**
 c) What is internal and external fragmentation in storage management? Explain with an example. **04**
 d) Find the shortest path from vertex 1 to all the other vertices, using Dijkstra's Algorithm for the following graph. **06**



Part C

- Q.7 a) Differentiate between the following **08**
 i) B-Tree of order m and B+Tree of order m.
 ii) AVL Tree and Red Black Tree
 iii) DFS graph traversal and BFS graph traversal.
 iv) Dijkstra's shortest path algorithm and Bellman Ford shortest path algorithm.
- b) Explain the Binary Tree Sort. Perform the Binary Tree Sort on the following data, **06**
 80 50 48 62 100 95 14 20.
- c) With an example explain Boundary Tag Method, for allocation and freeing of memory blocks. **06**

- Q.8
- a) Explain Compaction and Garbage collection technique with reference to storage management. **05**
 - b) Explain the implementation of an algorithm, to find a single source shortest path having negative weights on the edges of the graph. **06**
 - c) Explain the implementation of Kruskal's Algorithm, to find the minimum cost spanning tree. Compute the minimum cost spanning tree using the Kruskal's Algorithm for the following graph. **09**

