



1.

- Write an algorithm to reverse the content of a given list using a stack data structure. (6 mark)
- Write the prefix and postfix notation for the following expression.
 $(A+B)*C-(D-E)^F$ (8 mark)
- Write a simple algorithm to test whether the queue is empty or not. (4 mark)
- Briefly explain the concept of delimiter matching using a stack. (7 mark)

2.

- Write the routines needed to be followed in deleting a node considering all aspects from Binary Search Tree. (8 mark)
- Construct a B-tree with order $m=3$ for the key values 2,3,7,9,5,6,4,8,1 and delete the values 4 and 6. Show the tree performing all operations. (8 mark)
- Show the result of deleting 12 from the Red-Black tree given below in Figure 1. (4 mark)

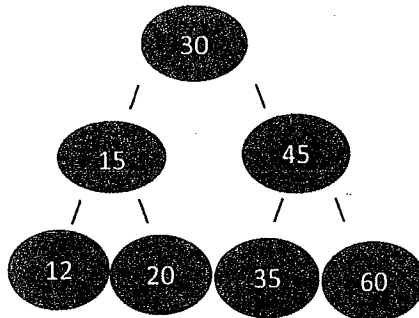


Figure 1: Red-Black Tree

- Construct a binary search tree by inserting 30,10,4,19,62,35,28,73 into an initially empty tree. Show the resulted tree after splaying node 4 and 62 respectively for the above constructed tree. (5 mark)

3.

- a. Compare and contrast tree data structure with graph data structure. (6 mark)
- b. Explain the Breath First Search (BFS) algorithm for traversal of any graph with suitable example and define the time complexity of the algorithm. (7 mark)
- c. Sort the vertices by applying topological sorting on following graph in Figure 2. (5 mark)

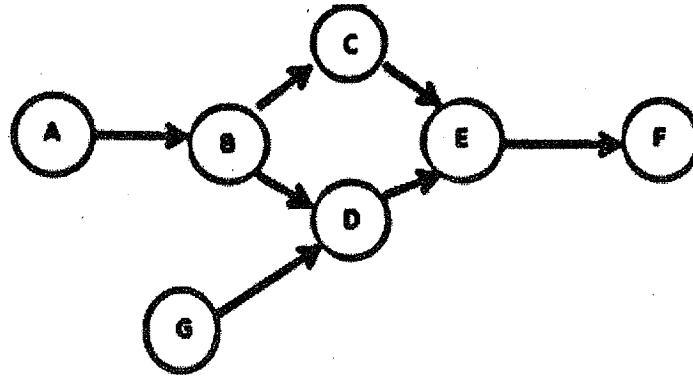


Figure 2: Graph 'G'

- d. Derive an eleven (11) entry hash table that results from the hash function $h(i) = (3i + 4) \bmod 11$ for the following key values. Assume that collisions are handled with double hashing where the second hash function is $h'(i) = 5 - (i \bmod 5)$. (7 mark)

Key values = 34,45,23,67,87,12,37,68,43,12,45

