



B.Tech. Degree IV Semester Examination April 2017

CS/IT 15-1405 DATA STRUCTURES AND ALGORITHMS (2015 Scheme)

Time: 3 Hours

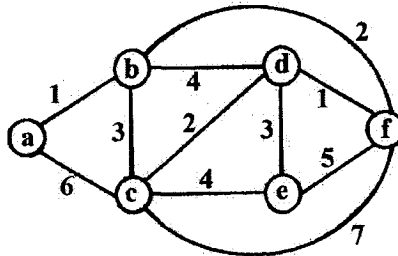
Maximum Marks: 60

PART A

(Answer *ALL* questions)

(10 × 2 = 20)

- I. (a) What is Data Structure? What are the two classifications of data structures?
 (b) Write an algorithm for Bubble sort.
 (c) Write short note on Deque.
 (d) Differentiate Stack and Queue.
 (e) What is circular list? Does a circular list has a front and rear reference? Justify.
 (f) Construct an AVL tree for the following set of numbers: 10, 20, 30, 15, 13, 40.
 (g) What is an Expression tree? Represent $((a+b)*(c-d))/f$ as an expression tree.
 (h) Construct the binary tree whose preorder traversal is A B D E C F G and inorder traversal D B E A F C G.
 (i) Write short note on minimum spanning tree.
 (j) Consider the following graph:



Which one of the following cannot be the sequence of edges added, in that order, to a minimum spanning tree using Kruskal's algorithm? Give reason.

- (i) (a—b), (d—f), (b—f), (d—c), (d—e)
- (ii) (a—b), (d—f), (d—c), (b—f), (d—e)
- (iii) (d—f), (a—b), (d—c), (b—f), (d—e)
- (iv) (d—f), (a—b), (b—f), (d—e), (d—c)

PART B

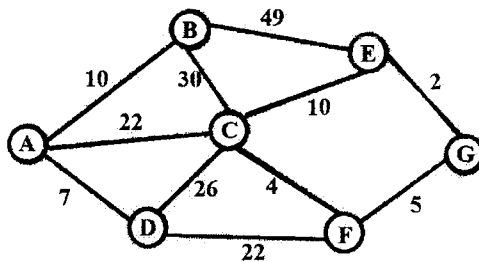
(4 × 10 = 40)

- II. (a) Write heap sort algorithm. Explain its working with an example.
 (b) The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \bmod 10$ and linear probing. What is the resultant hash table? Also construct a hash table for the same set of keys using quadratic probing and same hash function.

OR

(P.T.O.)

- III. (a) Explain Binary Search algorithm with example.
 (b) Write short note on Associative arrays and the various operations supported by associative arrays.
- IV. Write the pseudocode to perform polynomial addition using linked list.
- OR**
- V. (a) Which is the best data structure to check whether an arithmetic expression has balanced parentheses? Implement that data structure using Linked list.
 (b) Write the code to implement a queue using an array.
- VI. A binary search tree is generated by inserting in order the following integers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24.
 What is the number of nodes in the left subtree and right subtree of the root? Also write the preorder and postorder traversal of the tree. Also write the pseudocode for the different tree traversal methods.
- OR**
- VII. (a) What are threaded binary trees? What is the advantage of a threaded binary tree?
 (b) Write short note on k-d trees.
- VIII. (a) Consider the following graph:



Which one of the following can be a possible order of edges added to the minimum spanning tree using Prim's algorithm starting from A?

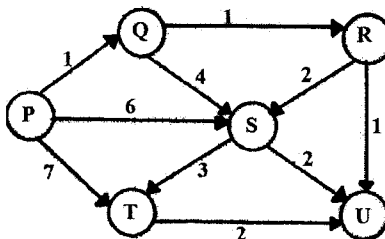
- (i) (E, G), (C, F), (F, G), (A, D), (A, B), (A, C)
- (ii) (A, D), (A, B), (A, C), (C, F), (G, E), (F, G)
- (iii) (A, B), (A, D), (D, F), (F, G), (G, E), (F, C)
- (iv) (A, D), (A, B), (D, F), (F, C), (F, G), (G, E)

Justify your answer. Also write Prim's algorithm for finding the minimum spanning tree.

- (b) Which are the graph representation techniques? Explain with an example.

OR

- IX. (a) Differentiate DFS and BFS traversal.
 (b) Suppose we run Dijkstra's single source shortest-path algorithm on the following edge weighted directed graph with vertex P as the source. In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized?



- (i) P, Q, R, S, T, U
- (ii) P, Q, R, U, S, T
- (iii) P, Q, R, U, T, S
- (iv) P, Q, T, R, U, S

Also explain Dijkstra's Algorithm.