Printed Pages: 2 **Sub Code: KCS- 301**

Paper Id: 233380 **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM III) THEORY EXAMINATION 2022-23
DATA STRUCTURE

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

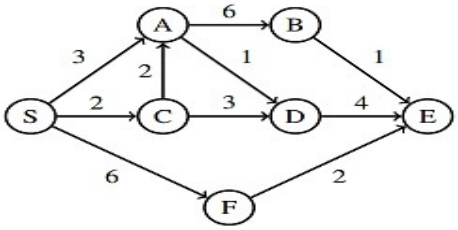
(a) Define best case, average case and worst case for analyzing the complexity of a program.
(b) Differentiate between binary search tree and a heap.
(c) Write the condition for empty and full circular queue.
(d) What do you understand by tail recursion?
(e) Construct an expression tree for the following algebraic expression:
(a - b) / ((c * d) + e)
(f) Differentiate between internal sorting and external sorting.
(g) What are the advantages and disadvantages of array over linked list?
(h) Write an algorithm for Breadth First Search (BFS) traversal of a graph.
(i) In a complete binary tree if the number of nodes is 1000000. What will be the height of complete binary tree.
(j) Which data structure is used to perform recursion and why?

SECTION B

2. Attempt any *three* of the following: 10x3=30

(a) Assume that the declaration of multi-dimensional arrays X and Y to be,
X (-2:2, 2:22) and Y (1:8, -5:5, -10:5)
(i) Find the length of each dimension and number of elements in X and Y.
(ii) Find the address of element Y (2, 2, 3), assuming Base address of Y = 400 and each element occupies 4 memory locations.

(b) What is Stack? Write a C program for linked list implementation of stack.
(c) Write an algorithm for Quick sort. Use Quick sort algorithm to sort the following elements: **2, 8, 7, 1, 3, 5, 6, 4**
(d) Write the Dijkstra algorithm for shortest path in a graph and also find the shortest path from 'S' to all remaining vertices of graph in the following graph:



(e) The order of nodes of a binary tree in inorder and postorder traversal are as follows:

In order : **B, I, D, A, C, G, E, H, F.**

Post order: **I, D, B, G, C, H, F, E, A.**

(i) Draw the corresponding binary tree.
(ii) Write the pre order traversal of the same tree.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

(a) How to represent the polynomial using linked list ? Write a C program to add two polynomials using linked list.

(b) Discuss doubly linked list. Write an algorithm to insert a node after a given node in singly linked list.

4. Attempt any *one* part of the following: 10x1=10

(a) Write an algorithm for converting infix expression into postfix expression. Trace your algorithm for infix expression Q into its equivalent postfix expression P,

Q: A + (B * C – (D / E ^ F) * G) * H

(b) What is circular Queue? Write a C code to insert an element in circular queue?

5. Attempt any *one* part of the following: 10x1=10

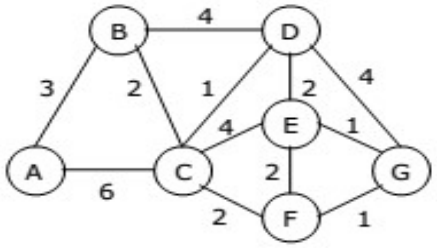
(a) What is Hashing? Explain division method to compute the hash function and also explain the collision resolution strategies used in hashing.

(b) Write an algorithm for Heap Sort. Use Heap sort algorithm, sort the following sequence:

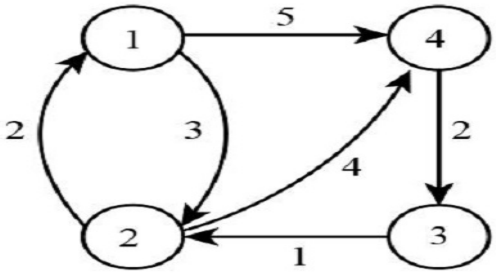
18, 25, 45, 34, 36, 51, 43, and 24.

6. Attempt any *one* part of the following: 10x1=10

(a) What is spanning tree? Write down the Prim's algorithm to obtain minimum cost spanning tree. Use Prim's algorithm to find the minimum cost spanning tree in the following graph:



(b) Write and explain the Floyd Warshall algorithm to find the all pair shortest path. Use the Floyd Warshall algorithm to find shortest path among all the vertices in the given graph:



7. Attempt any *one* part of the following: 10x1=10

(a) Discuss left skewed and right skewed binary tree. Construct an AVL tree by inserting the following elements in the order of their occurrence:

60, 2, 14, 22, 13, 111, 92, 86.

(b) What is B-Tree? Write the various properties of B- Tree. Show the results of inserting the keys **F, S, Q, K ,C, L, H, T, V, W, M, R, N, P, A, B** in order into a empty B-Tree of order **5.**