

**B.TECH.**  
**(SEM IV) THEORY EXAMINATION 2022-23**  
**BASIC DATA STRUCTURE & ALGORITHMS**

Time: 3 Hours

Total Marks: 100

**Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- (a) Discuss space and time complexity of an algorithm?
- (b) Write the syntax to check whether a given circular queue is full or empty?
- (c) Draw a binary Tree for the expression:  $A * B - (C + D) * (P / Q)$ .
- (d) What is the advantage of linked list over an array?
- (e) Define transitive closure.
- (f) Write an algorithm of bubble sort and its time complexity also.
- (g) Write down the various applications of linked list.
- (h) Write an algorithm for Breadth First Search (BFS) traversal of a graph.
- (i) Differentiate between internal sorting and external sorting.
- (j) Discuss about data structure which is used to perform recursion?

**SECTION B****2. Attempt any three of the following: 10x 3 = 30**

- (a) Assume the declaration of multi-dimensional arrays A and B to be, A (-2:2, 2:22) and B (1:8, -5:5, -10:5)
  - (i) Find the length of each dimension and number of elements in A and B.
  - (ii) Find the address of element B (2, 2, 3), assuming Base address of B =400 and there are W=4 words per memory location.
- (b) Define Stack? Write a C program for array implementation of a stack.
- (c) Write an algorithm for Insertion Sort. Use Insertion sort algorithm, 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 discuss with the help of suitable example.
- (e) Construct a Huffman tree for given characters A, B, C, D, E, F, G, H and I having frequencies 15, 6, 7, 12, 25, 4, 6, 1 and 15 respectively. What will be the code of AHEAD in binary?

**SECTION C****3. Attempt any one part of the following: 10 x 1 = 10**

- (a) How to represent the polynomial using linked list Write a C program to add two polynomials using linked list.
- (b) Discuss singly linked list? Write an algorithm to insert a node after given node in singly linked list.

4. Attempt any one part of the following: 10 x 1 = 10

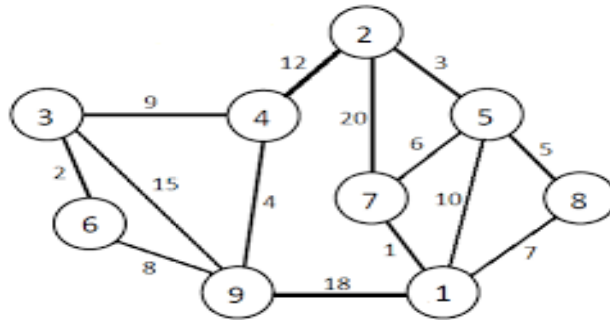
- (a) Write an algorithm for converting infix expression into postfix expression. Trace your algorithm for infix expression Q into its equivalent postfix expression P,  
Q:  $A+(B*C-(D/E^F))*H$
- (b) Write short note on the following:
  - (i) Priority Queue
  - (ii) Circular Queue

5. Attempt any one part of the following: 10 x 1 = 10

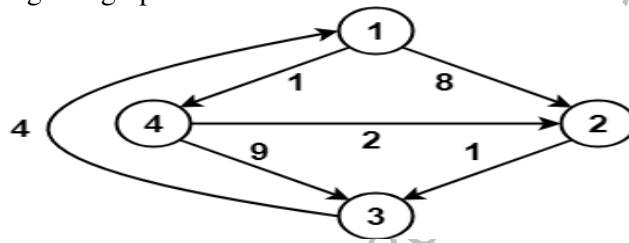
- (a) Define Hashing. Explain mid-square and digit folding method to compute the hash function with the help of an example.
- (b) Write an algorithm for Quick Sort. Use Quick sort algorithm, sort the following sequence: 18, 25, 45, 34, 36, 51, 43, 24.

6. Attempt any one part of the following: 10 x 1 = 10

- (a) Discuss spanning tree. Write down the Kruskal algorithm to obtain minimum cost spanning tree. Use Kruskal algorithm to find the minimum cost spanning tree in the following graph:



- (b) Write down the Floyd Warshall algorithm to solve 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: 10 x 1 = 10

- (a) Explain B-tree. Write down the properties of it. Construct a B-tree on the following sequence of inputs:  
10,20,35,40,50,60,75,80,95  
Assume that the order of the B-tree is 3.
- (b) Write short note on the following:
  - (i) Internal and External Sorting
  - (ii) B+ tree