

**B.TECH**  
**(SEM III) 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.**

**2x10=20**

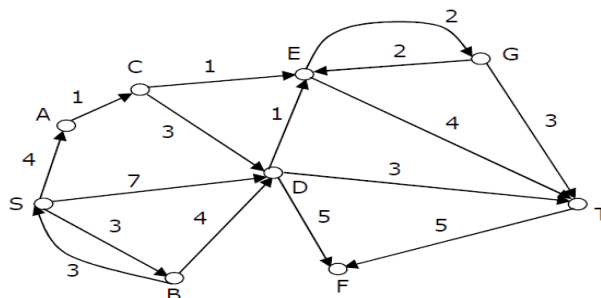
- (a) Define algorithm and its characteristics.
- (b) List the various asymptotic notations? Explain Big Oh notations along with suitable diagram.
- (c) In the reference of Tower of Hanoi problem if there are 7 disks. Solve the number of years will it need to move from one tower to another, assume that one move takes 1 second.
- (d) Explain circular queue. What is the condition if circular queue is full?
- (e) Differentiate strict and Complete Binary Tree.
- (f) Define Binary heaps.
- (g) Explain Transitive closure of a Graph.
- (h) List the different types of representation of graphs
- (i) Differentiate Internal and External Sorting.
- (j) State the number of swaps perform by bubble sort to sort the following array of integer 9,2,3,5,4,1,10,8,7,

**SECTION B**

**2. Attempt any three of the following:**

**10x3=30**

- (a) Consider a multi-dimensional Array in C language ARR [20] [30] [40] and address of ARR [2][3][4] is 1000. Calculate the address of ARR [6] [7] [8] in row major order and column major order. Assume the first element is stored at ARR [1][2][3] and each element take 2 bytes.
- (b) Write a C program to delete a node from K<sup>th</sup> position in singly linked list.
- (c) Construct an expression tree for the following algebraic expression.  
 $(3a-b) \uparrow 2(4c+2d) \uparrow 3$   
**Note:  $\uparrow$  is exponent operator.**
- (d) Find the single source shortest path for following graph using Dijkstra algorithm.



- (e) Compare B tree and B+ tree with suitable example.

## SECTION C

3. Attempt any *one* part of the following: **10x1=10**
- (a) Consider a 2-dimension array LTM [10...100] [10...80] in lower triangular matrix (LTM) representation. The size of each element in array is 2 bytes. If the array is implemented in the memory in the form of row major order and base address of array is 1000, then write the address of LTM [30][40].
  - (b) Write a complete C program to add to polynomial using singly linked list.
4. Attempt any *one* part of the following: **10x1=10**
- (a) Implement C language to print Fibonacci series using recursive and non-recursive function.
  - (b) Write an algorithm to evaluate postfix expression also find the value of 7,5,2,-,\* ,4,1,5,-,/,+.
5. Attempt any *one* part of the following: **10x1=10**
- (a) For a binary tree T, the preorder and in-order traversal sequences are as follows :  
In order: B C A E G D H F I J  
Preorder: A B C D E G F H I J
    - (i) Construct a binary Tree.
    - (ii) What is its post-order traversal sequence?
  - (b) A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the piece of message (each character occupies 7 bits) written in *italic* letter.  
*when you are on the left you are on the right. when you are on the right, you are on the wrong.*  
Suggest the answer to following question based on above problem.
    - (i) Construct Huffman tree.
    - (ii) Decode the message following message 1011110101011111111100.
    - (iii) Calculate the percentage of space saved in the message after compression?
6. Attempt any *one* part of the following: **10x1=10**
- (a) Write sort notes on following.
    - (i) Topological Sort
    - (ii) Activity Network
  - (b) Differentiate between Breadth First Search (BFS) and Depth First Search (DFS) with suitable example.
7. Attempt any *one* part of the following: **10x1=10**
- (a) Write an algorithm for Merge Sort. Explains with the help of suitable example.
  - (b) Construct a B-Tree of order 5 with the following sequence of integer.  
10,90,20,80,30,70,40,60,50,35,55,15,25,5,75,85,95,45,100,22,12.