# B022312(022)

## B.Tech. (Third Semester) Examination
## April-May ~~2021~~ 2022

### (AICTE Scheme)

### (Comp. Sc. & Engg. Branch)

### DATA STRUCTURE & ALGORITHMS

*Time Allowed : Three hours*

*Maximum Marks : 100*

*Minimum Pass Marks : ~~40~~ 35*

*Note : First part of each unit is compulsory containing 4 marks. Attempt any **two** questions from (b), (c) and (d) carries 8 marks each. Schematic diagrams and steps must be shown whenever necessary.*

### Unit-I

1. (a) What are the advantages of linked list over array?   4

   (b) Given an array and a number, find two integers that sum to the given number. Write an algorithm for this.   8

(c) What is time complexity? Explain the significance of big 0, theta $\theta$ and omega $\Omega$ notations. 8

(d) An array VAL [ 1....15 ] [ 1....10 ] is stored in the memory with each element requiring 4 bytes of storage. If the base address of the array VAL is 1500, determine the location of VAL [ 12 ] [ 9 ] when the array VAL is stored.

(i) Row wise

(ii) Column wise 8

### Unit-II

2. (a) A stack of int is implemented using an array as the following data type : 4

```
# define SIZE 20
typedefstruct {
int data [SIZE];
int top;
} Stack;
```

Fill up the missing codes in the PUSH, POP and TOP operations of the Stack. [ 1*3 = 3 marks ]

Answer :

```
void Push(Stack *s, int d) {
s->data[++s->top] = d;
-------------------
}
void Pop (Stack *s) {
--s->top;
--------
}
int Top(Stack *s) {
return s->data[s->top];
-------------
}
```

(b) Convert the following infix expression to postfix notation by showing the operator stack and output string after reading each input token :

A*B + C*(D-E) – F * G 8

(c) Explain the limitation of linear queue insertion operation and explain the solution with insertion algorithm. 8

(d) Write an algorithm for insertion and deletion operation performed on a stack. 8

## Unit-III

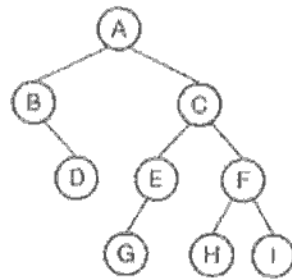3. (a) Apply binary search to find 123 in a list.

    35, 89, 114, 123, 143, 191, 197, 211, 240, 286,

    845, 890                                                4

   (b) Write in-order, preorder and post order for the
   following binary tree.                                   8



   (c) What is binary tree? Mention the properties of a
   binary tree. Define and compare the following :

      (i) Strict binary tree

      (ii) Complete binary tree                             8

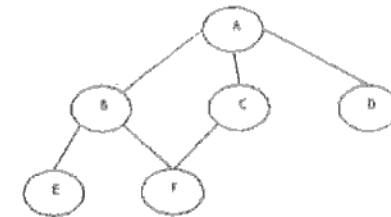   (d) Construct a max heap for the given array of elements :  8

      1, 5, 6, 8, 12, 14, 16

## Unit-IV

4. (a) Apply BFS and DFS on the below graph :              4



   (b) Write an algorithm to implement Kruskal's algorithm.
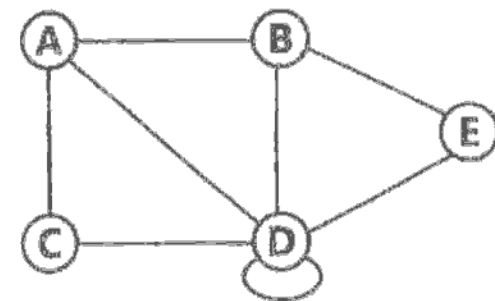   Also explain with the help of a suitable example.       8

   (c) For the graph shown below find the following :      8

      (i) Adjacency list representation

      (ii) Adjacency matrix representation

      (iii) Adjacency multilist representation

(d) Explain insertion and deletion of a new element in . Binary search tree along with algorithm. 8

## Unit-V

5. (a) Explain the purpose of B and B + tree. 4

(b) Explain the merge sort algorithm. Why does it run faster than bubble sort in most of the cases? Show how the merge sort algorithm will sort the following array in increasing order :

100, 90, 80, 70, 60, 50, 40, 30, 20 8

(c) What do you mean by hasing? What are the application where you will prefer hash tables to other data structures? What do you mean by collision? How is it handled? 8

(d) Explain the improvement of performance by the use of height-balanced tree over binary tree. Explain how a height-balanced tree can be formed by inserting the following elements in the given order :

1, 2, 3, 4, 5, 6, 8, 9, 10, 7, 11 8