**DATA STRUCTURE**

**Assignment-1**

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Q.1 Discuss how selection of a suitable data structure plays an important role in software development?

Answer : **Choosing a suitable data structure is a very important factor for a software developer. A developer should keep this thing in mind that every data structures has it’s own Advantages as well as disadvantages. For example few data structures takes more time to execute the same function or a program where as the other data structure may take less time to do that particular work. So one should have a good knowledge regarding data structures and should choose a perfect data type as per their requirements.**

**Few examples of data structures are given below:**

1. **Linked List**
2. **Circular Linked List**
3. **Stack**
4. **Queue**
5. **Binary Search Tree**

Q.2 What does abstract data type means?

Answer : **An abstract data type is a kind of data type which specifies the logical and mathematical model of the data type.**

Q.3 What do you mean by complexity of an algorithm? Explain the meaning of worst-case analysis and best case analysis with an example.

Q.4 Define a sparse metrics. Write a program to create sparse matrix from the simple matrix.

Answer : **A sparse matrix can be obtained by solving an element problem in 2d. The Final solution of the sparse matrix is a matrix in which most of the elements are zero.**

Q.5 Define data type and abstract data type. Comment upon the significance of both.

Answer :

**A data type can define the type of operations that we can perform on that particular data. It also tells how that data can be stored or used. It contains the values that a function or a variable can take.**

**A data type plays a very important role as it defines the data type and the operations that we can perform on it.**

**An abstract data type is a kind of data type which specifies the logical and mathematical model of the data type**

**Ab abstract data type is very crucial for a programmer for example Stack programs are all abstract data type based and all the operations that are used in stack are useful for a programmer.**

Q.6 Write a procedure to reverse a singly linked list.

Answer : **The steps for Reversing a single linked list are given below:**

**Step 1. Set the PTR = FIRST**

**Step 2. Set TPT = NULL**

**Step 3. We have to repeat step 4 while PTR! = NULL**

**Step 4. CPT = LINK(PTR)**

**LINK(PTR) = TPT**

**TPT = PTR**

**PTR = CPT**

**Step 5. Stop the Program**

Q.7 By taking an example show how multidimensional array can be represented in one dimensional array.

Q.8 Write an algorithm to merge two sorted arrays into a third array so that resulting array is the sorted one.

Answer :

**Create an array that has the size of the two sorted arrays.**

1. **Copy all elements of array 1 to array 3**
2. **Traverse array 2 and one by one insert elements array 3 to array 1.**
3. **Create an array array 3 of size array 1 + array 2.**
4. **Copy all elements of array 1 to array 3**
5. **Traverse array 2 and one by one insert elements of array 3 to array 1.**

Q.9 What data structure would you mostly likely see in a non-recursive implementation of a recursive algorithm?

Answer : **In a non recursive implementation of a recursive algorithm we would see a Stack data structure**

Q.10 Compare Array and of linked list?

Q.11 Whether Linked List is linear or Non-linear data structure? Provide statement in support.

Answer : **The Linked List is Linear data structure.**

**Linked List is a linear data structure because it stores data in a linear format and while traversing we need to traverse in a sequential manner not in a random way or a zig zag way.**

Q.12 Explain what the effect will be if both continuous linked versions of sequential search have only one item in the list and when the list is empty.

Q.13 A two-dimensional array TABLE [6] [8] is stored in row major order with base address 351. What is the address of TABLE [3] [4]?

Q.14 What is the difference between a grounded header link list and a circular header link list?

Answer : **The Main Difference between Ground Header Link and a Circular Header link list is that in a grounded header list the last node contains the null pointer and in a circular header list the last node points back to the header node.**

Q.15 Explain the method to calculate the address of an element in an array. A 25\*4 matrix array DATA is stored in memory in ‘row-major order’. If base address is 200 and 4 words per memory cell. Calculate the address of DATA [12, 3].

Q.16 How do you find the complexity of an algorithm? What is the relation between the time and space complexities of an algorithm? Justify your answer with an example.

Q.17 Compare two functions n2 and 24n for various values of n. Determine when second becomes larger than first.

Q.18 Explain an efficient way of storing a sparse matrix in memory. Write a module to find the transpose of a sparse matrix stored in this way.

Q.19 Explain an efficient way of storing two symmetric matrices of the same order in memory.

Q.20 What is the difference between a Stack and an Array?

Answer :

**Stack :**

1. **Stacks are based on LIFO (Last in first out)**
2. **Insertion and Deletion can be done from one end only which is the Top**
3. **It has a dynamic size**
4. **Only Linear Search is possible**

**Array :**

1. **Elements are based on the index position values.**
2. **Insertion and deletion can be performed at any index value.**
3. **They have fixed size**
4. **Can do both linear and binary search**