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DSA LAB - 3

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Theory

1) A. Array: An array is a collection of fixed number of components, all of same data type.

Arrays are declared using data type, variable name followed square brackets [ ] for each dimension of an array.

General syntax: array Name [index] where index is a non-negative value and determines size of array. Value of index is the position of the item in the array.

Declaring 1-D array: datatype array-name [int Exp] where int Exp is a non-negative integer.

Arrays are stored in memory in a continuous way. First a memory address is allocated to base value index 0 and every successive element is stored in the incremented memory address thus putting all elements of an array together.

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2) A. a) ADT stands for Abstract Data type.
An Abstract Data type is atype or class for objects whose behaviour is defined by a set of value, set of operations and set of instructions.

It only gives operations but doesn't control implementation of program like how memory is managed etc. This process is implementation-independent.

b) A data structure is called persistent when it stores previous version of itself when modified. These type of data structures are called persistent data structures.

Every updated version can be accessed. They actually yield a new updated data structure.

3) A.

Linear Data structures	Non-linear Data structures
1) Data structures where elements of data are sequentially or linearly arranged are called Linear Data structures.	1) Data structures where elements of data are not sequentially or linearly arranged are called Non-linear Data structures.
2) Here, single level is involved. Element are present in this level only.	2) Here, multiple levels are involved. Elements are present in hierarchy.
3) Implementation is easy compared to non linear data structure.	3) Implementation is complex in comparison to linear data structure.
4) Data elements can be traversed in single run.	4) Data elements can't be traversed in single run.
5) Memory is not utilized efficiently.	5) Memory is utilized efficiently.
6) Ex: Array, stack, queue	6) Ex: Trees, Graphs

4)A. **Advantages of an Array:**

1) Arrays have random access to elements. So, accessing elements is faster.
2) They represent multiple data values of same type using single name.
3) Searching is easy using arrays.
4) 2-D arrays are useful while representing matrices.
5) Memory allocation and utilization is efficient.

5)A. **Disadvantages of an Array:**

1) Once ~~fix~~ fixed, size of array can't be changed.
2) Insertion and deletion of specific elements is difficult since they are stored in consecutive memory locations.
3) Array allows data items of only ~~Sa~~ Same data type while struct allows all types of data type.
4) If index is given is out of range of an array, while compiling it displays time error instead showing the index is out of range.

6)A. Applications of an Array:

1) Arrays stores data elements of same data type. The main application of arrays. Since it can store large amounts of data that too at a single place of same data type avoids using of multivariables and makes data processing easier

2) Arrays dimensions are very helpful while solving matrix operations. since dimensions of array mainly 2-D creates a matrix, they are super helpful.

3) Arrays are used to perform search algorithms like linear Search, binary search etc. again which makes it data maganement easier

4) Arrays are used to perform sorting algorithms like insertion sort, bubble sort etc.

5) Arrays are used in implementing other data structure such as stacks, queues, heaps etc. This provides vast resources for easy data management.

6) Arrays are used in CPU scheduling algorithms.

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7)A. An abstract data type is characterized by following properties:

1) It exports a type
2) It exports a set of operations. This set is called interface.
3) operations of the interface are the one and only access mechanism to the type's data structure
4) Axioms and preconditions define the application domain of the type.

8)A. Arrays are declared using data type, variable name followed by square brackets [] for each dimension of an array.

General syntax: datatype arrayname [index] where index is non-negative integer. For Ex: int data[10];

Declaring 1-D array: datatype array-name [index] where index is non-negative integer. Index specifies size of array while declaration. It is also used to specify position of data item in an array.