OMKAR BHARITKAR

112016020 ECE

Omkar R. Bhavitkar
1120160020 ECE

DSA Lab 3 : Theory

Q1. What is array ? How are arrays declared ? How are the elements of an array stored in memory.

→ 1) An array is a data structure that caintains a group of elements.

2) Array variables are declared identically to variables of their data types, exped that the variable name is followed by one pair of square [ ] brackets for each dimension of the array.
For eg. if x is a parameter and is intended to represent an array of integers, it can be declared as any one of the following declarations:
int[x] ; int *x; int x[10] ;

3) An array stores its elements in cantiguous memory location. if you created the array locally it will be an Stack. Where the elements are stored depends on the storage specification

Q2. Define the terms:

a) ADT:

→ Abstract Data type (ADT) is a type (or class) for objects whose behaviour is defined by a set of values and a set of operations. it is call 'abstract' because it gives an implementation-independent view.

b) Persistent data structure:

→ A persistent data structure is a data structure that always preserves the previous version of itself when it is modified. Such data structure are effectively immutable, as their operations do not (visibly) update the structure in-place, but instead always yield a new updated structure.

Q3. In what respect linear data structures differ from non-linear data structures?

→ ① In linear data structure, data elements are sequentially connected, and each element is traversable through a single run whereas in non-linear data structure, data

elements are hierarchically connected and are present at various levels.

(2) In linear data structure, all data elements are present at a single level where as in non linear data structure data elements are present at multiple levels.

(3) Linear data structures are easier to implement, Non linear data structures are difficult to understand and implement as compared to linear data structures.

(4) Linear data structures can be traversed completely in a single run, Non linear data structures are difficult to understand.

(5) Linear data structures are not very memory friendly, Non linear uses memory very efficiently.

Q4. What are advantages of array data structures?

→ Advantages of array data structure:

(1) Arrays represent multiple data items of the same type using a single name.

② In arrays, the elements can be accessed randomly by using the index number.

③ Arrays allocated memory in contiguous memory locations for all its elements. Hence there is no chance of extra memory being allocated in case of arrays. This avoids memory overflow or shortage of memory in arrays.

④ Using arrays, other data structures linked lists, stacks, queues, trees, graphs etc can be implimented.

⑤ Two-dimensional arrays are used to represent matrices.

Q5. What are the disadvantages of array data structures?

→ Disadvantages of Array data structure

① The number of elements to be stored in an array should be known in advance.

② An array is a static structure (which means the array is of fixed size). Once declared the size of the array cannot be modified. The memory which is allocated to it cannot be increased or decreased.

③ Insertion and deletion are quit difficult in an array as the elements are stored in consecutive memory locations and the shifting operation is costly.

④ Allocating more memory than the requirement leads to wastage of memory space and less allocation of memory also leads to a problem.

Q6. State and explain applications of arrays.

→ Applications of arrays:

① Array stores data elements of the same data type.

② Maintains multiple variable names using a single name. Arrays help to maintain large data under a single variable name. This avoid the confusion of using multiple variables.

③ Arrays can be used for sorting data elements. Different sorting techniques like Bubble sort, Insertion sort, Selection sort etc use arrays to store and sort elements easily.

④ Arrays can be used for performing matrix operations. many databases, small and large, consist of one-dimensional and two-dimensional arrays where elements are recorded.

⑤ Arrays can be use for OS scheduling.

⑥ Lastly, arrays are also used to implement other data structures like stacks, Queues, Heaps, Hash tables, etc.

Example: You use arrays all the time in programming. whenever you have to keep track of an ordered list of items you will end up using ~~an~~ array an array.

Q7. What are the properties of abstract data types?

→ General Properties:

An abstract data type is an en encapsulation mechanism. In general it is composed of several components.

① A data structure or structures (often called the sorts).

② A set of operations (called the method of operations).
③ A precise description of the type of the methods (called a signature).
④ A precise set of rules about how it behaves (called the abst. ct specification or the axiomatic description).
⑤ An implementation hidden from the programmer who uses the data type.

Q8. How are arrays declared ?

→ Same question repeated (Q1. b).