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DATA STRUCTURE
(CAT-201)

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Pointer

- variables in C are abstractions of memory, holding a value. That value is *typed*, defined by a data type definition in the variable declaration.
- A pointer is no different. A pointer is a variable whose value is an address, typed by its declaration. Pointers "point to" a variable (memory) with a typed value by referencing that variable, not by name, but by address.

- **Symbol Name Description**

& address of operator Determines the address of a variable.

* indirection operator Accesses the value at the address.

Declaration of pointer

- Pointers are declared to point to a typed value. This is the syntax of a declaration:
- *datatype *variable_name*

- Here are some examples:

int *ptr1;

float *ptr2;

char *ptr3;

These declare ptr1 to hold the address of an integer, ptr2 to hold the address of a floating point number, and ptr3 to hold the address of a character.

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Advantages of pointer

- Return multiple values from function
- Access any memory location
- Improves the performance
- Reduces the code
- Used for dynamic memory allocation
- Used in arrays, functions and structures

Dynamic memory allocation

- Dynamic memory allocation means to allocate the memory at run time. Dynamic memory allocation is possible by 4 functions of stdlib.h header file.
- malloc()
- calloc()
- realloc()
- free()
- **malloc()**Allocates single block of requested memory.
- **calloc()**Allocates multiple block of requested memory.
- **realloc()**Reallocates the memory occupied by malloc() or calloc() functions.
- **free()**Frees the dynamically allocated memory.

DATA STRUCTURE

Data Structure

- A data structure is an arrangement of data in a computer's memory or even disk storage.
- The logical and mathematical model of a particular organization of data is called a data structure.
- A **data structure** is a particular way of storing and organizing data in a computer so that it can be used efficiently.

An example of several common data structures:

- arrays,
- linked lists,
- stacks,
- queues,
- trees,
- and Graph

DATA STRUCTURE(ARRAY)

Linear array (One dimensional array) : A list of finite number n of similar data elements referenced respectively by a set of n consecutive numbers, usually 1, 2, 3,…..n. That is a specific element is accessed by an index.

- Let, Array name is A then the elements of A is : $a_1, a_2 \ldots\ldots a_n$
- Or by the bracket notation A[1], A[2], A[3],……., A[n]
- The number k in A[k] is called a subscript and A[k] is called a subscripted variable.

DATA STRUCTURE(ARRAY)

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Two dimensional array)

- Two dimensional array is a collection of similar data elements where each element is referenced by two subscripts.
- Such arrays are called matrices in mathematics and tables in business applications.

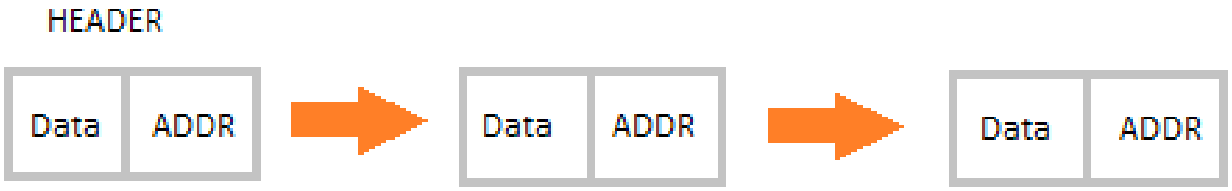
2.Multidimensional arrays are defined analogously

Array Data Structure

- It can hold multiple values of a single type.
- Elements are referenced by the array name and an *ordinal* index.
- Each element is a *value*
- Indexing begins at zero.
- The array forms a contiguous list in memory.
- The name of the array holds the address of the first array element.
- We specify the array size at compile time, often with a named constant.

DATA STRUCTURE (LINKED LIST)

- A linked list, or one way list, is a linear collection of data elements, called nodes, where the linear order is given by means of pointers.
- Dynamically allocate space for each element as needed.



Reference: http://www.studytonight.com/data-structures/introduction-to-linked-list

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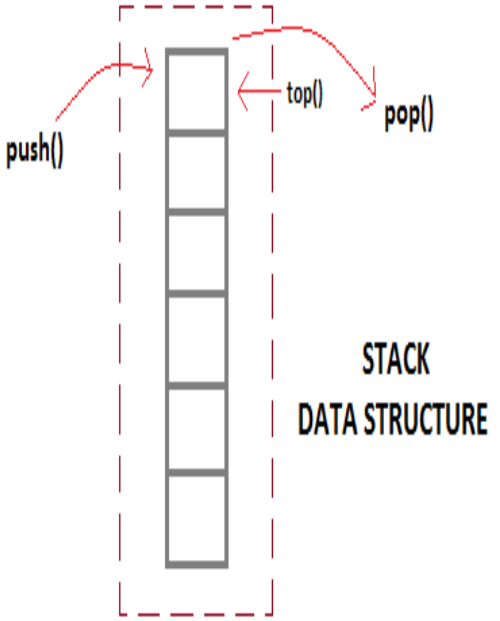
DATA STRUCTURE (STACK)

- Stacks are a special form of collection with LIFO semantics
- Two methods
  - add item to the top of the stack
  - remove an item from the top of the stack
- Like a plate stacker

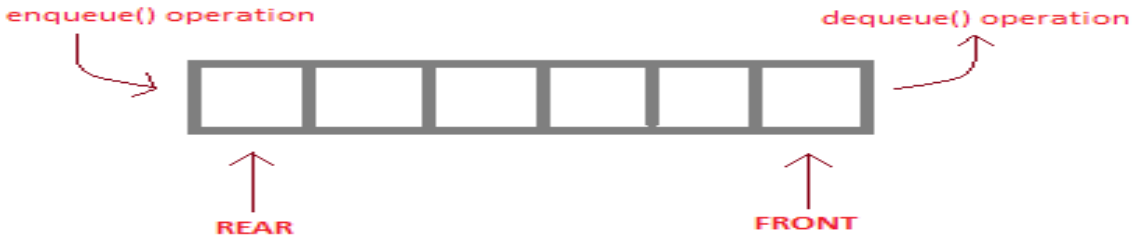


http://www.studytonight.com/data-structures/stack-data-structure

DATA STRUCTURE (QUEUE)

Like a stack, a queue is also a list. However, with a queue, insertion is done at one end, while deletion is performed at the other end

- The insertion end is called rear
- The deletion end is called front



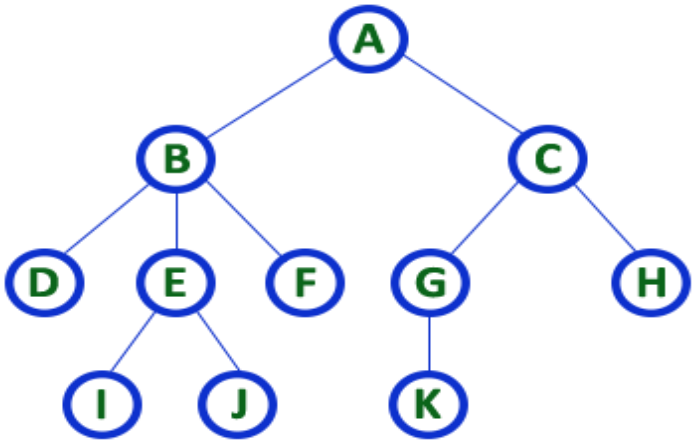
enqueue( ) is the operation for adding an element into Queue.
dequeue( ) is the operation for removing an element from Queue .

QUEUE DATA STRUCTURE

Reference: http://www.studytonight.com/data-structures/queue-data-structure

DATA STRUCTURE(TREE)

- Tree is a non-linear data structure which organizes data in hierarchical structure and this is a recursive definition.
- Tree data structure is a collection of data (Node) which is organized in hierarchical structure and this is a



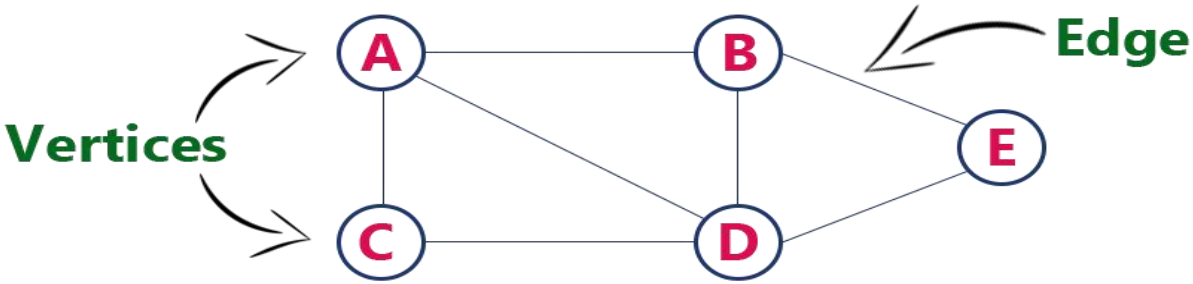
TREE with 11 nodes and 10 edges

- In any tree with 'N' nodes there will be maximum of 'N-1' edges
- In a tree every individual element is called as 'NODE'

Reference: http://btechsmartclass.com/DS/U3_T1.html

DATA STRUCTURE(GRAPH)

- Graph is a collection of vertices and arcs which connects vertices in the graph
  Graph is a collection of nodes and edges which connects nodes in the graph
- Generally, a graph G is represented as G = (V , E), where V is set of vertices and E is set of edges.
- Example



Reference: http://btechsmartclass.com/DS/U3_T8.html

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FAQ

- What are the different ways to represent data?
- What operation are performed on data in arrays?
- Differentiate linear and non linear data structure

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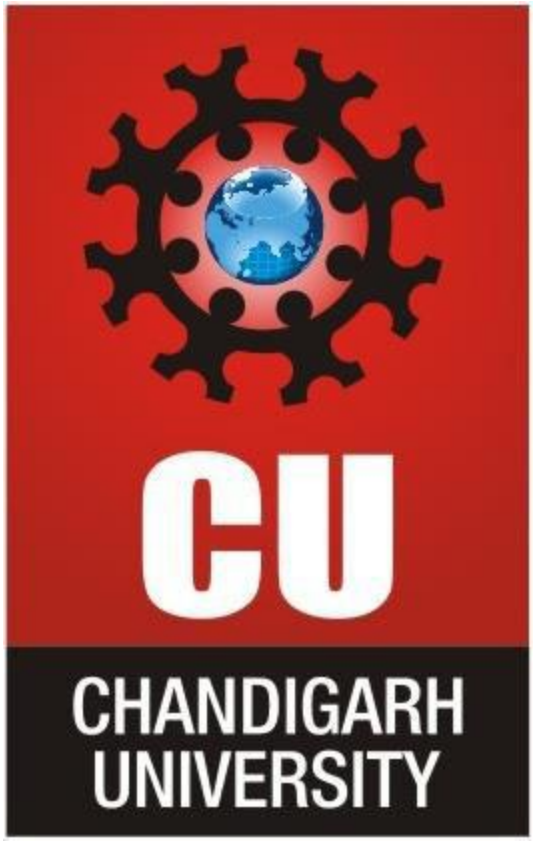
- http://btechsmartclass.com/DS/U1_T9.html



Thank You