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Date 20/03/2022

Page \_\_\_\_\_

## ASSIGNMENT-1

### Data Structures and Algorithm Analysis

Q1. What do you mean by recursion? Discuss advantages and disadvantages of recursion.

Ans.

Recursion is a process in which the problem is specified in terms of itself.

The function should be called itself to implement recursion. The function which calls itself is called as recursive function. A condition must be specified to stop recursion; otherwise it will lead to an infinite process. In case of recursion, all partial solutions are combined to obtain the final solution. Example: Factorial of a number.

#### Advantages:-

- (i) The main benefit of a recursive approach to algorithm design is that it allows programmers to take advantage of the repetitive structure present in many problems.
- (ii) Complex case analysis and nested loops can be avoided.
- (iii) Recursion can lead to more readable and efficient algorithm descriptions.
- (iv) Recursion is also a useful way for defining objects that have a repeated similar structural form.



### Disadvantages:-

- (i) Slowing down execution time and storing on the run-time stack more things than required in a non recursive approach are major limitations of recursion.
- (ii) If recursion is too deep, then there is a danger of running out of space on the stack and ultimately program crashes.
- (iii) Even if some recursive function repeats the computations for some parameters, the run time can be prohibitively long even for very simple cases.



Q. What is a Stack data structure? List the operations that can be performed on a stack.

Ans.

Stack is a linear data structure which follows a particular order in which the operations are performed. The order may be LIFO (Last in First Out) or FILO (First in Last out).

A stack is a list in which insertions and deletions are allowed only at one end of the list. This end is called the top of the stack.

#### Operations:-

- Push:- Adds an item in the stack. If the stack is full, then it is said to be in an overflow condition. The push operation is used to insert an element into the stack. The new element is added at the topmost position of the stack.
- POP:- Removes an item from the stack. The items are popped in the reversed order in which they are pushed. If the stack is empty, then it is said to be an Underflow condition. This operation is used to delete the topmost element from the stack. However, before deleting the value, we must first check if  $TOP = NULL$ .
- PEEK/TOP:- Returns the Top element of the stack. It is an operation that returns the value of the



stack without deleting it from the stack.

- isEmpty: Returns true if the stack is empty,  
else false.