

CSL201 – Lab 2 (Semester I, 2017-18)

Write a program (C / C++) to apply the concepts of stacks and queues for addressing 5 different types of queries.

These 5 queries are denoted by **S**, **Q**, **I**, **E**, and **P** and these query type identifiers correspond to -

- performing **S**tack operations,
- performing **Q**ueue operations,
- converting **I**nfix expression to equivalent postfix expression,
- **E**valuating infix expression value and
- computing stack **P**ermutation, respectively.

The first line of the input contains an integer **T** denoting the number of queries. Then there follows T lines, each line correspond to a query and query type is identified with the first character in that line which could be either **S**, **Q**, **I**, **E**, or **P**.

Query type identifier is then followed by parameters specific to that query as discussed below. These parameters would be single-space separated.

Query Type	Parameters	Explanation
S	Integers, P, F, E, N, #	Integers range : -1000 to 1000 Integer: Push that value in the stack P: Pop F: Is_Stack_Full E: Is_Stack_Empty N: Number of elements currently in stack #: Denotes end of the query. Ignore any symbol after # <u>Query Response:</u> Number of elements finally in the stack Then the elements (if any) in reverse order as popped out from stack (all to be single space-separated).
Q	Integers, D, F, E, N, #	Integers range : -1000 to 1000 Integer: Insert/Enqueue that value in the queue D: Dequeue F: Is_Queue_Full E: Is_Queue_Empty N: Number of elements currently in queue #: Denotes end of the query. Ignore any symbol after # <u>Query Response:</u> Number of elements finally in the queue Then the elements (if any) in serial order as de-queued from the queue (all to be single space-separated).

I	Integers, Operators, and #	<p>Max 20 operators. # used to mark the end of query. Ignore any symbol after # Integers range : 0 to 1000 No brackets etc. No operators other than what mentioned below would be considered valid. Operands and Operators are single-space separated. Some operators may consist of two characters e.g. >> <u>Query Response:</u> Postfix expression where operands and operator are single-space separated. No space before first operand. If expression is invalid, mention ONLY “Error” without quotes</p>
E	Integers, Operators, and #	<p>Max 20 operators. # used to mark the end of query. Ignore any symbol after #. Integers range : 0 to 1000 No brackets etc. No operators other than what mentioned below would be considered valid. Operands and Operators are single-space separated. Some operators may consist of two characters e.g. >> <u>Query Response:</u> Value of the evaluated expression If expression was invalid, mention “Error” without quotes</p>
P	N k	<p>kth sequence (in lexicographic ordering) in stack permutations possible using N numbers observed in the order as follows: 1,2,3,...,N. (N would be less than equal to 15) <u>Query Response:</u> Total number of stack permutations possible with these N different numbers, and then the kth stack permutation.</p>

Stack for integers to be implemented using linked list. Stack for non integer elements to be implemented using array.

Queue can be implemented using either array or linked-list.

Print **Error** if query type identifier is other than what’s discussed above.

Print **Error** if parameters are not specific to the query type under consideration or parameters are not in proper format as mentioned above.

Example Input:	Corresponding Output:
14	
P 3 3	5 2 1 3
P 3 2	5 1 3 2
P 2 2	2 2 1
E 1 + 2 * 3 #	7
E 1 + 3 - 5 #	-1
E 4 + 3 & 5 <= 18 #	1
E 4 + 3 * 5 <= 18 #	0

I 1 + 2 * 3 #	1 2 3 * +
I 1 + + 2 #	Error
I 1 + 2	Error
I 1 + 2 * #	Error
S -6 20 30 4 P P 13 16 F N E F #	4 16 13 20 -6
Q -6 20 30 4 D D 13 16 N F E #	4 30 4 13 16
Q 1 -1 2 -2 D 3 -3 D D #	3 -2 3 -3

Operators	Associativity
* / %	left to right
+ -	left to right
<< >>	left to right
< <= > >=	left to right
== !=	left to right
&	left to right
^	left to right
	left to right

Weightage: S and Q : 10% each , I and E : 20% each, P : 40 %

I / E : 10 % only if your program don't support 2 characters operators e.g. >=

Instructions regarding submission:

- Single .c or .cpp file
- Input outputs that you tried or used for testing your code can be included in your program file at end within comments (using /* */)
- There is reward for early submissions : 2% for each 24 hours earlier. Max 10% reward
- There is penalty for late submission: -2% for each 1 hour late.
- Filename format: <RollNo>_lab2_CSL201.c or <RollNo>_lab2_CSL201.cpp e.g.
2016EEB1188_lab2_CSL201.c
- Deadline: 26/9/2017 11:59pm