CS69201: Computing Lab-1
Test-2
July 30, 2024

========== Instructions ==========

1. Q1, Q2 and Q3 carry 20 marks each and Q4 carry 40 marks each.
2. In the case of user input assume only valid values will be passed as input.
3. You can use C or C++ as the programming language. **However, you are not allowed to use any STL libraries in C++**
4. Regarding Submission: For each question create a separate C file. -> <rollno>_Q1.c, <rollno>_Q2.c, <rollno>_Q3.c,<rollno>_Q4.c. Create a zip file of all these C files in the name <rollno>_T2.zip and submit it to Moodle. For example, if your roll number is 24CS60R15, then your file names will be 24CS60R15_Q1.c, 24CS60R15_Q2.c, 24CS60R15_Q3.c, 24CS60R15_Q4.c and your zip file name will be 24CS60R15_T2.zip.

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Question 1 : Given a string ‘s’ (an Infix expression) as input. Convert it to an equivalent Postfix expression.

Example :
Input : “((X - Y) * 25 - A) ^ B”
Output : “X Y - 25 * A - B ^”

Operands to be allowed : [a-z],[A-Z], Any number
Operators to be allowed : +,-,*,/,^
[You should also handle ‘(’, ‘)’ and each operand/operator must be separated by a space ‘ ‘ in both input and output strings]

Question 2 : Given a string ‘s’ (a Postfix expression) as input, evaluate and display the answer. Note that space is present between operators and operands (numbers) in the input.

Example :
Input : “10 10 + 5 *”
Output: 100

Operators allowed are the same as the previous question. Operands will only be numbers here.

Question 3 : Given an array, write a Quicksort algorithm to sort the array. Use the middle element of the array as pivot i.e after dividing the array based on the middle element, the middle element of the left part is taken as pivot and the middle element of the right part is taken as pivot respectively. Also print the pivot elements and the sorted array.

Input :
N : 5
Enter array elements : 4 5 2 1 3

Output :
Pivot elements : 2, 1, 5, 4, 3
Sorted array : 1 2 3 4 5

Explanation
First pivot = 2
Left array contains 1
Right array contains 4 5 3

Pivot left 1
Pivot right 5

And so on…

For even elements, choose either of the two middle elements

Eg) If at any given point, the subarray (even the whole array itself) is [1,9,2,6,1,2], the element 2 or 6 can be considered as pivot elements. For a single element, print the element as pivot.

Question 4: Given an array, write **TimSort**(with run size = 16) to sort the array and display the sorted array.

Input : First line takes input N(number of elements in the array). The second line contains N integers.

Output : Print the sorted array.

Example Input :
10
9 10 1 2 3 4 8 7 5 6
Output: 1 2 3 4 5 6 7 8 9 10
----------End----------