



Data Structures and Algorithms I

SCS 1201

Assignment 03

Question 1

Assume a machine that has a single register and six instructions.

- LD A** which places the operand **A** into the register.
- ST A** which places the contents of the register into the variable **A**.
- AD A** which adds the contents of variable **A** to the register.
- SB A** which subtracts the contents of the variable **A** from the register.
- ML A** which multiplies the contents of the register by the variable **A**.
- DV A** which divides the contents of the register by the variable **A**.

Write C a program that accepts a postfix expression containing single-letter operands and the operators **+, -, *,** and **/** and which prints a sequence of instructions to evaluate the expression and leave the result in the register.

Use variables of the form **TEMPn** as temporary variables.

For example, the postfix expression **ABC*+DE-/** should yield the printout.

```
LD    B
ML    C
ST    TEMP1
LD    A
AD    TEMP1
ST    TEMP2
LD    D
SB    E
ST    TEMP3
```

LD TEMP2

DV TEMP3

ST TEMP4

Note: Your submission should include the following

- a. Complete C code for the above scenario
- b. A report including the methodology, fully commented programs, and valid test data, and test results.

Question 2

The laughs parking garage contains a single lane that holds up to ten cars. Cars arrive at the south end of the garage and leave from the north end. If a customer arrives to pick up a car that is not northernmost, all the cars to the north of his car are moved out, his car is driven out, and the other cars are restored in the same order that they were in originally. Whenever a car leaves, all the cars to the south are moved forward. So that at all the times all the empty spaces are in the south part of the garage.

Write a C program to reads a group of input lines. Each line contains an "a" arrival or a "d" departure and a license plate number. Cars are assumed to arrive and depart in the order specified by the input. The program should print a message each time that a car arrives or departs. When a car arrives, the message should specify whether or not there is room for the car in the garage. If there is no room for a car, the car waits until there is a room or until a departure line is read for the car. When the room becomes available, another message should be printed. When a car departs, the message should include the number of times the car was moved within the garage (including the departure itself but not the arrival), this number is 0 if the car departs from the waiting line.

Note: Your submission should include the following

- 1) Complete C code for the above scenario.
- 2) A report including the methodology, fully commented programs and valid test data and test results.

Upload your submission in a zip file with your INDEX NUMBER to the LMS on or before **1st of September 2022** (before **11.55 pm**) and **plagiarism will be considered very seriously.**

You have to appear for a **viva** of this assignment. The exact date and the time slot for each individual viva will be announced in due course.