CS251-2018-19-II Midsem Examination

February 23, 2019

1 Questions

1.1 Question 1 (20)

You are provided with a zip file which is encrypted with a password. The password is of 4 characters having the following format:

- First Character: `<UPPERCASE_LETTER[A-Z]>`
- Second Character: `<LOWERCASE_LETTER[a-z]>`
- Third Character: `<SYMBOL[@#]>`
- Fourth Character: `<DIGIT[0-9]>`

1.2 Question 2 (20)

On extracting the contents of the zip, you will find a binary executable (`prog`). The executable will fail to run because of a missing library. The library's header file is provided and you will have to implement the given functions and compile it as a dynamic library to successfully execute the program.

1.3 Question 3 (20 + 10)

The program runs 2 sorting algorithms as functions `sort1` and `sort2`. Use profiling tools to get the total execution times (including time taken by called functions) of both these functions. Your task is to write a bash script which runs the program for inputs ranging from 1 to 10 and generate a csv file in the following format:

```
input(n), time for sort1, time for sort2
```

Plot a line graph from data obtained above using ggplot2 in R with `n` in the X-axis and two different lines (in the same plot) for `sort1` and `sort2` in the Y-axis.

Note: `gprof` sometimes reports time in milliseconds and sometimes in seconds. You can either divide the values which are greater than 100 by 1000 or use your own heuristic for getting values in the same units.

1.4 Question 4 (20 + 10)

Both `sort1` and `sort2` return values when called but the values are not being printed anywhere. Use your mastery of gdb to extract the return values of both these functions. Your task is to write a bash script which runs the program for inputs ranging from 1 to 10 and generate a csv file in the following format:

```
input(n), return for sort1, return for sort2
```

Hint: the return value from a function is present in the register `rax` just after returning from the function call. `sort1` is called at line number 24 and `sort2` is called at line number 26. The filename of the c file (not provided) is `prog.c`

Plot a line graph from data obtained above using ggplot2 in R with n in the X-axis and two different lines (in the same plot) for `sort1` and `sort2` in the Y-axis.

2 Submission Policy

Submit a zip file with separate folders for each question having the following contents:

- Question 1: a file `passwd` containing the password for the zip and any scripts/tools used to get the password. **Note:** Submitting only password will fetch you 0 marks.
- Question 2: The C file for the library, the dynamic library and a bash script which will run the executable after compiling the library.
- Question 3: The csv file for the data, the R plot and the bash script used. **Note:** Submitting only data/plot will fetch you 0 marks.
- Question 4: The csv file for the data, the R plot and the bash script used. **Note:** Submitting only data/plot will fetch you 0 marks.

Directory structure:

```
.
 q1
    ...files
 q2
    ...files
 q3
    ...files
 q4
     ...files
```

3 Clue Policy

For each question, you can choose to get a solution to proceed to the next question. Note that you forfeit all marks for that particular question in doing so. For each question, the following solutions would be given:

- Clue 1: You will get an unencrypted zip file (-20)
- Clue 2.1: You get the C file implemented as the library (-5)
- Clue 2.2: You get the compilation + execution command for running the executable (-15)
- Clue 3: You get the csv file for the data (-20) which you can use to plot
- Clue 4: You get the csv file for the data (-20) which you can use to plot