End Semester Lab Examination

CS2.201a Computer Systems Organization (CSO)

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1   Assembly Programming (5 x 2 = 10 marks, 1 hour)

Assemble and link a sample *temp.s* file with the commands:

```
1  bash assemble_assembly.sh
```

Sample *temp.s* that takes two numbers and prints the result of adding them:
Input/Output Format

- Input: *a b*

- Output: *sum*

```
1   .section .rodata
2   .INP_STR:
3      .string "%d_%d"
4   .OUT_STR:
5      .string "%d\n"
6
7   .section .text
8   .globl main
9   main:
10     subq $8, %rsp
11     leaq .INP_STR(%rip), %rdi
12     movq %rsp, %rsi
13     leaq 4(%rsp), %rdx
14     call scanf
15     movl 4(%rsp), %esi
16     addl (%rsp), %esi
17     leaq .OUT_STR(%rip), %rdi
18     call printf
19     addq $8, %rsp
20     xorl %eax, %eax
21     ret
```

1.1 Questions

1. Given two numbers M and N, find $GCD(M, N)$. (5 marks)

   Input/Output Format

   - Input: $M\ N$ $(0 < M, N < LLONG\_MAX)$
   - Output: Integral value of the GCD

2. Given 5 numbers, output the minimum and maximum numbers. (5 marks)

   Input/Output Format

   - Input: $a_1\ a_2\ a_3\ a_4\ a_5$ $(0 \le a_i \le LLONG\_MAX)$
   - Output: $min\ max$

2 Bomb Lab (10 marks, 1 hour)

This section is similar to the assignment that you have done in the course. The executable given to you needs a particular input to be "defused". To figure out what this input should be, you have to go through the assembly code of this executable. For an executable *bomb*, you might find the following commands to be relevant:

```
1  objdump -DS ./end-bomb
2  strings ./end-bomb
```

In the case of the *strings* program, please note that the strings in the program are all bundled together and you should be able to find the large blob of in-program strings pretty easily.

Expected File Structure

Please double check the file structure before leaving the lab. We might not be able to recover your submissions manually in the case of you mis-naming a file.

Create the following directory structure in your **home** (~) directory.

```
1  Lab-Exam
2      rollnumber_bomb.txt
3      rollnumber_q1.S
4      rollnumber_q2.S
```