End Semester Lab Examination

CS2.201a Computer Systems Organization (CSO)

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- User account: cso_mid_exam
- Password: c4s6ef46

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

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

```
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*

```
.section .rodata
.INP_STR:
  .string "%d %d"
.OUT_STR:
  .string "%d\n"

.section .text
.globl main
main:
  subq $8, %rsp
  leaq .INP_STR(%rip), %rdi
  movq %rsp, %rsi
  leaq 4(%rsp), %rdx
  call scanf
  movl 4(%rsp), %esi
  addl (%rsp), %esi
  leaq .OUT_STR(%rip), %rdi
  call printf
  addq $8, %rsp
  xorl %eax, %eax
  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: $a_1\ a_2\ a_3\ a_4\ a_5$ $(0 \leq a_i \leq LLONG\_MAX)$
   - 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:

```
objdump -DS ./end-bomb
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.

```
Lab-Exam
    rollnumber_bomb.txt
    rollnumber_q1.S
    rollnumber_q2.S
```