CSE231 Operating System (Section A), Quiz 01 Monsoon 2024
Time allocated: 4pm – 4:20pm

Name	
Roll Number	

Instructions:

- This **is a closed book and closed notes quiz. Please be aware of strict plagiarism policy.**
- For questions requiring justification, please be as concise as possible. 2-3 sentences would be the ideal size of a justification. No extra pages will be provided.

Question 1: The output of the command "gcc -static hello.c" will be similar in size to the output of the command "gcc hello.c". State True or False, and provide one line justification. Partial marks only if the justification is also appropriate **[0.75 marks].**

Answer:

False. "-static" flag will result in static linking resulting in bigger size as it contains the machine code of the program as well as that of the library methods it uses.

Question-3: (2 marks) Segments in an ELF file could be of **Type** "R-Read", "RW-Read/Write", and "RE-Read/Executable". Based on this information, provide the **Type** of segment(s) containing these sections: ".text", ".data", ".rodata", and ".bss". One line justification for each section. Partial marks only if the justification is also appropriate **[0.75 x 4 = 3 marks].**

Answer:

.text => RE (machine code is readable and executable type only)
.data => RW (contains global variable that would be readable and writable by the program)
.rodata => R (contains string literal which is readable type only)
.bss => RW (contains global variable that would be readable and writable by the program)

Question-3: Using the information provided in the Elf header, write the formula to calculate the byte offset (from starting of the file) to the start of the section header string table. **[2 marks]**

Answer:

e_shoff + (e_shentsize * e_shstrndx)

```
typedef struct {
        unsigned char   e_ident[EI_N
        Elf32_Half      e_type;
        Elf32_Half      e_machine;
        Elf32_Word      e_version;
        Elf32_Addr      e_entry;
        Elf32_Off       e_phoff;
        Elf32_Off       e_shoff;
        Elf32_Word      e_flags;
        Elf32_Half      e_ehsize;
        Elf32_Half      e_phentsize;
        Elf32_Half      e_phnum;
        Elf32_Half      e_shentsize;
        Elf32_Half      e_shnum;
        Elf32_Half      e_shstrndx;
} Elf32_Ehdr;
```

Question-4: For the following compiler flags: "-o", "-c", and "-S" to the gcc compiler, which of these file(s) are the corresponding input and output, respectively: a) source file, b) relocatable file, c) assembly file, d) executable file, and e) shared library. You should correctly provide the input and output for each flag to fetch partial marks. **NO** justifications required **[0.75 x 3 = 2.25 marks].**

Compiler Flag	Input File	Output File
"-o"	Relocatable file	Executable file
"-c"	Assembly file	Relocatable file
"-S"	Source code	Assembly file

Question-5: Identify the content of the stack slots 159 and 160. Also identify the position of EBP and ESP registers for the program execution / stack shown herewith. Execution is currently at line L5. Grey and Orange slots identify the stack frames for the methods main and foo, respectively.
NO justifications required **[0.5 x 4 = 2. marks].**

Answer:

Slot 159 => Address 161 or Base pointer of main method.
Slot 160 => Line L3 in main method
EBP => Pointing to Slot 159
ESP => Pointing to Slot 158