Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur

Compiler Laboratory: CS39003
3rd year CSE, 5th Semester

Assignment - 1: Annotating Assembly *Marks: 50*
Assign Date: August 04, 2022 Submit Date: 23:55, August 11, 2022

1. Translate the following C program using GCC/Linux to the assembly language program of x86-64 (Intel 64-bit processor) without optimization.

```
cc -Wall -S asgn1.c
```

C Program: *asgn1.c*

```
/*
* ass1.c Generate assembly code of x86-64 and comment
*/


#include<stdio.h>

int length(char str[20]);
void sort(char str[20], int len, char dest[20]);
void reverse(char str[20], int len, char dest[20]);

int main()
{
        char str[20],dest[20];
        int len;
        printf("Enter the string (all lowrer case): ");
        scanf("%s", str);
        len = length(str); //calling length function
        printf("Length of the string: %d\n", len);
        sort(str, len, dest); //calling sorting function
        printf("The string in descending order: %s\n", dest);
        return 0;
}

int length(char str[20])
```

```
{
        int i;
        for(i=0; str[i]!='\0'; i++) //computing length of the string
        {
                ;
        }
        return i;
}

void sort(char str[20], int len, char dest[20])
{
        int i, j;
        char temp;
        for(i=0; i<len; i++)
        {
                for(j=0; j<len; j++)
                {
                        if(str[i]<str[j]) //sorting in ascending order
                        {
                                temp = str[i];
                                str[i] = str[j];
                                str[j] = temp;
                        }
                }
        }
        //calling reverse to sort the array in descending order
        reverse(str,len,dest);
}

void reverse(char str[20], int len, char dest[20])
{
        int i, j;
        char temp;
        for(i=0; i<len/2; i++)
        {
                for(j=len-i-1; j>=len/2; j--) //reversing the string
                {
                        if(i==j)
                                break;
                        else{
                                temp = str[i];
                                str[i] = str[j];
                                str[j] = temp;
                                break;
                        }
                }
        }
        for(i=0;i<len;i++)
```

```
                dest[i]=str[i];
}
```

2. Rename the generated assembly file as *ass1_roll.s* (where *roll* is your roll number). Add comments for each of the assembly language instruction. Your comment should explain the functionality of the instruction and the connection to the original C program. Please make sure that your commented file can be compiled to generate executable file. Upload your file (`ass1_`*`roll`*`.s`) in Moodle server.

   Note: *Comments without connection to C program will get partial marks.*