Department of Computer Science and Engineering

Exam: **Final**   Year: **2021**   Trimester: **Fall**   Course: **CSE 1111/CSI 121**
Title: **Structured Programming Language**   Marks: **40**   Time: **2 hrs + 15 min**

Answer all of the Questions given in the **Section-A** and **Section-B**. At first complete all the Questions in **Section-A** and then **Section-B**. Numerical figures in the right margin indicate full marks.

<u>Section-A</u>

Show the **manual tracing** for each of the programs (assume they are syntactically correct) given below. In the programs, LAST_FOUR_DIGITS_OF_YOUR_STUDENT_ID is used. For example, if your STUDENT ID is 011202017 and the value of LAST_ FOUR_DIGITS_OF_YOUR_STUDENT_ID is 2017. Below, **Use your own student ID**.

1. In the **manual tracing**, **show** the values of the **globally declared** variables *a, b,* and *c* every   **[4]**
    time their values change.

```c
#include<stdio.h>
int a=0, b=0, c=0;
int func1(int x);
void func2(int *x, int y);
void func3(int x, int *y);
void main(){
        a = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID % 47;
        func3(a, &b);
        b = func1(a);
        func2(&a, b);
}
int func1(int p) {
        c = p + a;
        func2(&a, b);
        return c;
}
void func2(int *x, int b){
        *x *= 2;
        b = func3(a, x);
}
int func3(int c, int *n){
        c = 2;
        return ++(*n)**n;
}
```

2. In the manual tracing, show the value of variable *str1* and *str2* every time its value changes: **[4]**

```c
#include<stdio.h>
#include<string.h>
#include<ctype.h>
int main(){
    char arr[5][30] = {"Hello World!",
                       "Good morning.",
                       "UIU is the Best!",
                       "Are you a programmer?",
                       "Be a problem solver."};
    char str1[50], str2[50];
    int a = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID % 5;
    int b = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID % 4;
    int c = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID % 3;

    strcpy(str1, arr[a]);
    strcpy(str2, arr[(a+2)%5]);
    if(strcmp(str1,str2)>0){
        str1[b] = toupper(str1[c]);
    }else{
        str2[b] = toupper(str2[c]);
    }
    strncpy(str2, arr[c], a);
    strcat(str1, str2);
}
```

3. **Write** the final content of the test.txt file.   **[4]**

```c
#include<stdio.h>
void main(){
        FILE *file;
        int i, j, sum, a = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID;
        int num[] = {a, a+1, a+2, a+3, a+4, a+5, a+6, a+7, a+8, a+9};
        file= fopen("test.txt", "w");
        fprintf(file, "%s\n", "Hello 3 dosers!!!");
        for(i=4; i<=7; i++){
                fprintf(file, "Line %d: ", i);
                for(j=9; j>=0; j--){
                        if((i+j)%4==0)
                                fprintf(file, "%d, ", num[j]);
                }
                fprintf(file, "\n", num[i]);
        }
        fclose(file);
}
```

4. What is the output of the following code? Use the first 15 characters of your own full name   **[4]**
   to initialize the string variable *a*. If it is less than 15 characters, add your nickname repeatedly
   with spaces in between.

```c
#include<stdio.h>
#include<string.h>
int main(){
    char a[] = "PUT YOUR FULL NAME HERE";
    char *b=a;
    int n = strlen(a);
    for(int i=0;i<n;i++){
        if(a[i]==' ') printf("%c",tolower(a[i+1]));
    }
    printf("\n");
    for(int i=1;i<n;i++, b++);
    for(int i=0;i<n;i+=2, b-=2){
        puts(b);
    }
}
```

Section-B

5. Write a program where you declare and initialize a string with your own name. Display your name in reverse order using a recursive function. **[4]**

6. Write a program as part of the UCAM application that will store the Fall 2021 SPL final exam scores of sections A, B, C, D, E, and F using **a 2-D** array. The maximum capacity for any section is 45 students. In your program, initialize all the array values with (LAST_FOUR_DIGITS_OF_YOUR_STUDENT_ID % 11 + 10) values. Increment all the scores of section **C** by i^{10}, where i is the index of the score. **[5]**

7. Write a program that declares four strings and initializes them with the followings: **[5]**
    "Hello world.",
    "Isn't it a great morning so far?",
    "USE_YOUR_NICKNAME_HERE",
    "To be a champion, become a UIUian!"

    Only using these four strings construct a string that will have "Hello Shajid. Isn't It Great To Be A UIUian." if your nickname is "Shajid". DO NOT use any other strings or constant strings)
    Make sure the constructed string has title/camel casing.

8. Suppose we want to hire few employees for an uprising software company through online registration and aptitude test selecting from 50 candidates. To register, a candidate will provide the information mentioned in (i) below. When a candidate log on, his/her total marks will be shown on the screen. Now, write a C program considering the above scenario and the following information: **[5]**
    (i) Design a structure of candidate which contains Name, Email, Password, and Test Marks. You should declare appropriate data type for each variable. Initialize the members with default values with **your own** name, email, and other appropriate information.
    (ii) Take input for all the candidates in an array of candidates from keyboard. Array size = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID.
    (iii) As part of the login process, use a login() function. In the function, take an email and a password from user as credential. Find the candidate using these credentials from the array of candidates. If any match is found, display the total marks of that candidate. If not found, display "Wrong Email and/or Password".
    (iv) Call the login() function from the main function.

9. Write a program that performs the following operations. **[5]**
   (a) Use a user-defined function "search" that takes four parameters: (i) an array of float values, (ii) a value to search, (iii) an int value *n* - number of values in the array, and (iv) an int number *r*. The "search" function finds the *r*th occurrence of that value in the array. If found, returns the index. If not found, returns -1.
   (b) In the main function:
      i) Call the function "search" passing an array, a value to search, and an int a, where a = LAST_FOUR_DIGIT_OF_YOUR_STUDENT_ID % 10.
      ii) If found, display the value and the index. If not found, display "Not Found".
      (iii) Do all the necessary declarations, initialization, and input of variables as required.
   (c) Add appropriate prototypes of the function.