

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

WINTER SEMESTER, 2018-2019

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

CSE 4107: Structured Programming I

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) What is the difference between a **while** loop and a **do while** loop? Explain. 6
 b) Write the output of the following program: 11

```
#include <stdio.h>
int main()
{
    int i, j, k;
    for(i=0, j=0; i<5, j<5; i++, ++j){
        printf("Inside for loop %d %d\n", i, j);
    }
    while(++i<12 && j++<12){
        printf("Inside while loop %d %d\n", i, j);
        for(k=0; k<3; ++k, i++, ++j){
            printf("Inside nested for loop %d %d %d\n", i, j, k);
        }
    }
    return 0;
}
```

Figure 1: Program from Question no. 1(b)

- c) Write a C program which prints the number table of **n** numbers upto **m** multiples. There will be 6 (3×2) lines of output for a pair of input (**n** and **m**). In a general case, the output will contain **m×n** lines in total. The sample input and output is given below: 8

Table 1: Number table sample for Question no. 1(c)

Sample Input	Sample Output
3 2	1 * 1 = 1
	1 * 2 = 2
	2 * 1 = 2
	2 * 2 = 4
	3 * 1 = 3
	3 * 2 = 6

2. a) Sadaf likes to throw balls into the air with all his might. He becomes happy if the ball reaches greater height. However, he does not know how to calculate the maximum height his ball attains. Write a C program that will help him find the height of his projected ball. Assume that the ball is thrown in the direction perpendicular to the earth surface with an initial velocity of $V \text{ ms}^{-1}$. [Hint: Use the formula $v^2 = u^2 + 2as$, where u is the initial velocity, v is the final velocity, s is the displacement and a is the acceleration, and the acceleration due to gravity is 9.8 ms^{-2}] 8

- b) What are header files? Why do we need header files? Which header files do the following functions belong to? 8
- strcat()
 - sqrt()
 - printf()
 - cos()
- c) A function-tree is a visualization of function calls. A Fibonacci series is a sequential list of numbers, where each number is the sum of the previous two numbers. Therefore, a Fibonacci series of 8 numbers will be as follows: 0, 1, 1, 2, 3, 5, 8, 13. 9

```
int fib(int a)
{
    if(a==1) return 0;
    if(a==2) return 1;
    return fib(a-1)+fib(a-2);
}
```

Figure 2(a): Code for Question 2(c).

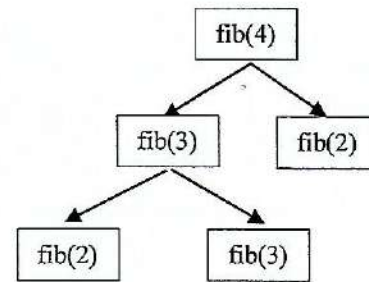


Figure 2(b): Function-tree for Question 2(c).

The function code to find the a^{th} Fibonacci number is given in figure 2(a). If the function-tree for $a=4$ is given in figure 2(b), draw the function-tree for $a=3$. Mention the return values of the functions in each step of the figure.

3. a) Answer the followings: 9
- Write a program that will read a string of characters from the console and print the number of vowels in that string. All the characters will be lower-case English alphabets and digits with no space.
 - Modify the previous program to count the number of digits.
- b) Will the following sections of codes in Figures 3(a) and 3(b) execute/run properly? Write the errors (if any) and make the necessary amends so that the program executes properly. 12

```
int ar[100], i=1, j=1, idx=-1;
for( ; i<=10; i++, j+=10){
    puts(i);
    arr[i] = i;
}
if(ar[idx]==idx)
    puts("value = index");
else printf("not same");
```

Figure 3(a): Sample Code 1 for Question 3(b).

```
void func(int a, int b){
    int ar[][]={1,7,9,4,6};
    int str[5][5];
    strcpy(str,ar);
    a=strcmp(str,ar);
    printf("%d", a)
    return str[5][5];
}
```

Figure 3(b): Sample Code 2 for Question 3(b).

- c) Fill up the following Table:

Table 2: Built-in C Functions

Function	Input	Output/Return
strcmp()	"stipend", "stupid"	
strcmp()	"base", "lcase"	
scanf("%d", &a)	5	
scanf("%d", &a)	c	

4. a) What are the two different types of functions? What are the main attributes of prototypes? 5
- b) Google is an extra-ordinary search engine as it uses highly optimized algorithms to find a webpage. Each webpage has some keywords which can be used to find it. Whenever a user types one of those keywords in the search bar, Google finds the pages by mapping the words to the pages. You are an engineer of Google and you have to organize the data to make it easier to find. Use any sorting algorithm within your knowledge to organize the webpages so that they are easier to find. You have to sort the keywords under each webpage and also sort the webpages according to their name. There can be N number of webpages and for each webpage there can be M number of words. The input will begin with the value of N , followed by N integers. Each of the N integers will be followed by the name of the webpage and M keywords. See the given sample input and output in Table 3 for reference: 20

Table 3: Sample input and output for Question no. 4(b)

Sample Input	Sample Output
3	
2 google search engine	alibaba - buy sale
3 microsoft hardware software product	google - engine search
2 alibaba sale buy	Microsoft - hardware product software