B.Sc. Engg. / HD CSE 1st Semester (107) 9 March 2017 (Afternoon)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **WINTER SEMESTER, 2016-2017**

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) A Pythagorean triple is a set of three integer a, b, c where the sum of the square of two of the numbers is equal to the square of the third number. Write a program that will take three integers as input from the user and print whether the numbers form a Pythagorean triple or not. The program will continue taking input until the user enters a Pythagorean triple as input. 9

   b) Write a program that will sort the following list in descending order. 11

   int list[10] = {3, 12, 5, 2, 7, 9, 3, 12, 4, 9}

   c) Differentiate between global variable and local variable with the help of suitable examples. 5

2. a) A diagonal matrix is a special kind of matrix with zeros in the off-diagonal elements. Two examples of diagonal matrices are given below: 8

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Figure 1: Diagonal Matrices

Write a program that will ask the user to enter the size n $(2 \leq n \leq 1000)$ of the matrix. The program will then take the elements of the matrix as input. Finally, the program will print matrix and say whether it is a diagonal matrix or not.

   b) You have been assigned the task of developing a grading software to calculate the grades of the students. The software will take the mark m, $(0 \leq m \leq 100)$ obtained by a student as input and then print the grade of the student according to Table 1. You have also been instructed to only use switch case in the program. The use of *if* condition will not be accepted by the clients. 11

Table 1: Grade-Mark table

Grade	Marks
A	70-100
B	50-69
C	40-49
F	0-39

   c) How many bytes are allocated to store an int type variable? Determine the largest signed number that can be stored in this type of variable. Show the necessary calculations. 6

3. a) What are the limitations and disadvantages of using *switch* instead of *if* statement? Explain using a suitable example. 5

   b) Determine the output for the following block of code. 12

```c
#include<stdio.h>
void f1(int x, int y);
double f2(double b);
int a = 5;
double b = 10;
int main(){
    int a = 15;
    printf("In main: a = %+.2lf,", (double)a);
    printf(" b = %+.2lf\n", (double)b);
    f1(a, b);
    printf("Leaving main: a = %+.2lf,", (double)a);
    printf(" b = %+.2lf\n", (double)b);
    return 0;
}
void f1(int x, int y){
    printf("In F1: a = %+.2lf,", (double)a);
    printf(" b = %+.2lf\n", (double)b);
    b = f2(x + y);
    printf("Leaving F1: a = %+.2lf,", (double)a);
    printf(" b = %+.2lf\n", (double)b);
}
double f2(double b){
    printf("In F2: a = %+.2lf,", (double)a);
    printf(" b = %+.2lf\n", (double)b);
    b = a + b;
    printf("Leaving F2: a = %+.2lf,", (double)a);
    printf(" b = %+.2lf\n", (double)b);
    return b + a;
}
```

Figure 1: Code for Question 3(b)

c) Write a program that will take a number n, as input from the user and draw a pattern similar to Figure 2. The output shown here is for $n = 5$. 8

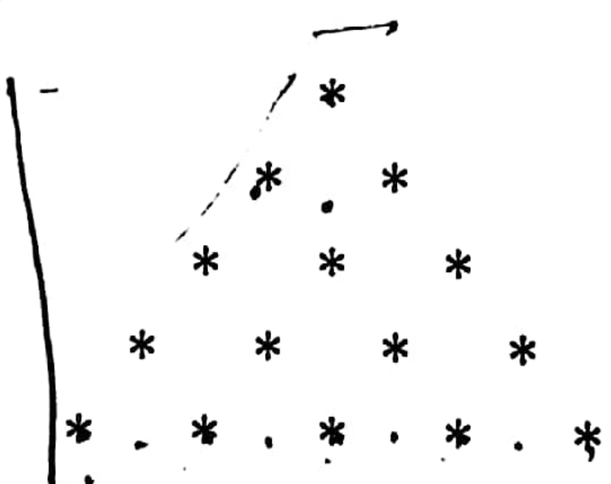

Figure 2: Figure for Question 3(c)

4. a) Write a program that will calculate and print the product of the following two matrices. 12

$$A = \begin{bmatrix} 5 & 9 \\ 3 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 9 & 8 \\ 3 & 11 & 3 \end{bmatrix}$$

Figure 3: Matrices for Question 4(a)

b) What do you mean by structured programming? Briefly discuss the three classes of programming language. 6

c) Write a program where the main function will take a character variable c, as input and print whether the input is an upper-case letter, lower-case letter or a number. You must write three separate functions to perform the three different checks. You cannot check the type of the character in the main function. 7