80

RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Information and Communication Technology
First Year - Semester I Examination – September/ October 2019

ICT 1402 – PRINCIPLES OF PROGRAM DESIGN AND PROGRAMING
(Theory)

Time: Three (03) hours

Answer all the questions.

1.

a) Draw a flowchart to find the even numbers from 1 to 100. (06 marks)

b) Which of the followings are not valid C identifiers? State the reasons for your answers. (04 marks)

i. My_Array
ii. _100_bottles
iii. $_month
iv. 1ST_payment
v. Number1

c) Show the outputs produced by each of the following program segments. Assume that i, j and k are integer type variables. (06 marks)

i.
```
i=2, j=3;
printf ("%d", (i+10)% j);
```

ii.
```
i=7, j=8;
i *=j+1;
printf ("%d %d", i, j );
```

iii.
```
i=2, j=1, k=0;
i*=j*=k;
printf ("%d %d %d", i, j,k );
```

iv. i=3, j=4, k=5;
printf ("%d ", i++ - j++ + --k);

d) Following if expression is unnecessarily complicated. Simplify it as much as possible. (04 marks)

```
if(age >=13)
        if(age<=19)
          Teenager = 1; //true
        else
          Teenager = 0; //false
else if(age < 13)
        Teenager = 0; //false;
```

2.

a) What are the three (03) control structures in structured programming? State the techniques used to demonstrate each of the structures. (05 marks)

b) What output does the following program segment produce? (i is an integer variable) (04 marks)

```
i =1;
switch(i%3){
        case0:  printf("Zero");      break;
        case 1: printf("one");       break;
        case 2:  printf("two");      break;

        }
```

c) Which one of the following statements is not equivalent to the other two.(assuming that the loop bodies are same.) Justify your answer. (05 marks)

i. while(i<10) {…}
ii. do{…. } while(i<10);
iii. for(; i<10;) {….}

d) Compare and contrast **break** and **continue** statements with two example situations where they can be applied. (06 marks)

3.

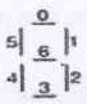
a) Suppose that *i* is a variable of type int. *f* is a variable of type float and *d* is a variable of type double. Explain what conversions take place during the execution of the following statement.

```
d = i + f;
```

Distinguish between explicit and implicit type conversions. (04 marks)

b) Calculators, watches and other digital devices often rely on seven segment displays for numerical output. To form a digit, such devices 'turn on' some seven segments while leaving others off.

Construct an array that remembers which segments should be on for such digits. Let's number the segments as follows: (06 marks)



c) The Fibonacci numbers are 0, 1, 1, 2, 3, 5, 8, 13, ... where each number is the sum of the two preceding numbers. Write a program fragment that declares an array named *fib_numbers* of length 40 and fills the array with the first 40 Fibonacci numbers. You can fill the first 2 numbers individually and use a loop to continue the rest of the numbers. (06 marks)

d) Compare and contrast the *write_only mode* and *append mode* in file handling. (04 marks)

4.

a) Differentiate between the methods of passing parameters by reference and passing parameters by value to a function. (04 marks)

b) Explain the scopes of following types of variables (06 marks)

i. Local variable
ii. Global variables
iii. Formal parameters

c) Write the expected output of the following code segment and discuss the reasons for your answer. (05 marks)

```
#include<stdio.h>
void fun1()
{
        int x =4;
        printf("%d\n", x);
}
void main()
{
        int x = 10;
        {
                int x=5;
                printf("%d\n", x);
        }
        printf("%d\n", x);
        fun1();
}
```

d) Compare and contrast C **calloc** and C **malloc** functions with respect to the dynamic memory allocation. (05 marks)

5.

a) Create a structure to define a rectangle with width and height. Write two functions to calculate the area and the perimeter of the rectangle. (Note: the parameters which are passed to the functions should be in struct type) (04 marks)

b) Write a C program to keep records of 10 students. A student record contains ID, name, gender, quizzes scores (2 quizzes per semester), mid-term score, final score, and total score. Assume you have to enter data for 10 records in the main program and use a function to calculate the total score (Passing structure to a function by reference). Obtain the total score of a student according to the given criteria.

i. 20% from quizzes
ii. 30% from mid-term score
iii. 50% from final score

(06 marks)

c) Write a C function to calculate the sum of two complex objects. To create a Complex object, use a structure with real and imaginary values as its properties. (05 marks)

d) Write the output of the following program and explain the formation of the result. (05 marks)

```
#include <stdio.h>
int main()
{
  char *s= "hello";
   char *p = s;
   printf("%c\t%c", p[0], s[1]);
   return 0;
}
```