Arab Academy for Science, Technology and Maritime Transport-College of Computing & Information Technology-Heliopolis

No. of Pages	:	Three
No. Of Questions	:	Four
Examiner	:	Dr. Emad Elsamahy Dr. Ahmed Salem

Acad. Year	:	Spring 2021/ 2022
Semester	:	2
Department	:	Computer Science
Time Allowed	:	120 Min.
Date	:	13 / 6 / 2022

CS143 Introduction to Problem Solving and Programming (Final Exam) **(40 Points)**

Question One: (5 Points)

Mark (√) or (X) for each of the following sentences:

1. Plagiarism is the violation of copyright agreements by illegally copying software for use in another computer ( )
2. All types of loops in C can be implemented using for loop. ( )
3. Finding errors tools, which is part of the IDE, can be used to detect syntax-errors in the C program. ( )
4. In case of unsorted array of integers, only sequential search can be used. ( )
5. The variable (i) can be decremented by (1), using the following commands:
   i=i-1, i=-1, --i, and i-- ( )
6. In C, the following statement can be considered as an example of the short circuit evaluation.
   (div != 0 || num % div == 0) ( )
7. In C, variable name can be any name (satisfying the rules) or a standard identifier. ( )
8. The loop in the shown program will be repeated for 2 times. ( )

```
#include <stdio.h>
void main()
  {
     int j;
     for (j=0; j>1; j++)
          printf("Hello\n");
  }
```

9. Recursion is used as a replacement of looping in C programs. ( )
10. Multiprocessing and multithreading can be used by the Operating System to enhance the computer performance in the existence of only one processor/core. ( )

Question Two: (5 Points)

Choose the correct answer (a, b, c, or d):

1. The shaded range on the right can be described using:

   a. (X>=0 || X<=100)
   b. (X<=0 && X>=100)
   c. (X<=0 || X>=100)
   d. (X>=0 && X<=100)

2. The function prototype: ***void PrintOutput(int sum, int avr)***, ... function.
   a. has input(s) and has no output
   b. has no input(s) and has no output
   c. has input(s) and has an output
   d. has no input(s) and has an output
3. The function ***CalAvr*** is used to calculate the average using the call by reference variables, should have the following prototype:
   a. double CalAvr(int Sum, int Count);
   b. void CalAvr(double *Avr, int Sum, int Count);
   c. void CalAvr(double &Avr, int Sum, int Count);
   d. double CalAvr(int sum, int Count);
4. Using the method of indirect reference in C, supposing that (X) is a pointer to (Y), the following statement can be used to set the value of (Y):
   a. Y=5;
   b. &X=5;
   c. *X=5;
   d. Y= =5;
5. After execution of (status=scanf("%d %d", &a, &b);), and the user inputs (a) and (b) as 15 and 'c'. (status) should return the value of:
   a. 0.
   b. 1.
   c. 2.
   d. -1.

6. Any array element (e.g. element 9) can be incremented by (1) using the following statement:
   a. X[8]++;
   b. X[8]+1=X[8];
   c. X[9]+=1;
   d. X[9]++;
7. A "stub" can be used in the .....testing.
   a. Unit
   b. Integration
   c. System
   d. Acceptance
8. To swap the contents of two variables, without the use of a third variable, the following C code can be used:
   a. x=x*y;
      x=x/y;
      y=x/y;
   b. y=x+y;
      x=y-x;
      y=y-x;
   c. y=x-y;
      x=x-y;
      y=x+y;
   d. tmp=x;
      x=y;
      y=tmp;
9. To left justified a string (y) when printed to the screen using (printf), the following command can be used:
   a. printf("%10s",y);
   b. printf("%-10[^\n]s",y);
   c. printf("%10[^\n]s",y);
   d. printf("%-10s",y);
10. For a string variable named (str[15]) which equals to "Ahmed Salem10", running the following C code will change (str) to the following value:

```
for (int i = 0; i < strlen(str); ++i)
    if (isalpha(str[i]))
        if (isupper(str[i]))
            str[i] += 32;
        else
            str[i]-=32;
    else
        str[i]='/';
```

   a. "aHMED sALEM10".
   b. "aHMED sALEM//".
   c. "Ahmed Salem//".
   d. "aHMED/sALEM//".

Question Three:

(15 Points)

Trace the following C programs.

1 (5 Points)

```
#include <stdio.h>
#include <string.h>

char *extract(char *x)
{
   char *y;

   if (x=='\0')
      printf("**********\n");
   else
      {
         y=strtok(x," ");
         extract(strtok(NULL,"."));
         printf("* %s.\n",y);
      }
}
void main()
  {
     char x[30];
     char *y;
     strcpy(x,"I Love Problem Solving");
     extract(x);
     printf("**********\n");
  }
```

2 (5 Points)

```
#include<stdio.h>

void Calculate (int x, int y, int *z)
{
   y=y+x;
   y-=3;
   *z=y+5;
}
void main()
{
   int a[]={10,3,4,7,2,1};
   int i;

   for (i=0;i<4;i++)
      Calculate(a[i],a[i+1],&a[i+2]);

   for (i=0;i<=5;i++)
      printf("%d\n",a[i]);
}
```

3 (5 Points)

```
#include <stdio.h>
void main()
{
   FILE *inp;
   int a, b, c, i=1;
   inp=fopen("Data.txt","r");
   while (i<=3)
     {
          fscanf(inp,"%d %d %d", &a, &b, &c);
          printf("%d:%dX%d=%d\n", a, b, c, b*c);
          i++;
     }
   fclose(inp);
}
```

Data.txt
1000 5 1
1001 4 2
1003 8 7

Question Four: (15 Points)

Write C program to solve the following problems.

1. It is required to ask the user to enter the following data items for 10 students: (6 Points)
   a. Student ID.
   b. Student GPA.

   These data must be stored in a structure containing: Student ID (*int Type*) and Student GPA (*double Type*).
   Then, it is required to print these data sorted in a descending order (*using any sorting algorithm of your choice*) as follows:

Student ID	(*2 tabs*)	GPA
20105051		3.95
20103440		3.84

   Your solution should contain the following functions:
   a. A function to accept the student ID and GPA, which will be stored in ***an array of structure***. The function prototype is:
      void GetData(struct STD std[]);
   b. A function to sort the data using any sorting technique (e.g. bubble sort or selection sort). The function prototype is:
      void DataSort(struct STD std[], int n);
   c. A function to display the data as previously mentioned. The function prototype is:
      void DispData(struct STD std[], int n);

2. Write a program using, **a recursive function**, to compute the element value of with a specific index for the sequence having the equation: (5 Points)

   $2*(n-1) + 3*(n-2)$ for $n>2$

   For example: 0, 1, 2, 7, 20, 61, ...
   Your program should ask the user for the element index and then output the element value.
   Note that: **the program must include a recursive function and using any other method rather than recursion will not be counted.**
3. Using for-loop, write a program that accept a series of positive numbers (with unknown count) ended by zero, then compute and display the following: (4 Points)
   a. Sum and average of even numbers.
   b. Sum and average of odd numbers.

   Note that: **DO NOT USE while or do-while loops.**

Best Wishes