KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

Information and Computer Science Department

2019 Summer Semester (Term 183)

ICS103 Computer Programming in C (2-3-3)

**Midterm Exam**

120 Minutes

|  |  |
| --- | --- |
| Student Name |  |
| KFUPM ID |  |  |  |  |  |  |  |  |  |
| Class Section | DR. Farag Azzedin SECN 01 | □ UMTW 08:10 am  |  |  |
| DR. Farag Azzedin SECN 02 | □ UMTW 9.20 am |  |  |
| DR. Farag Azzedin  SECN 03 | □ UMTW 10:30 am  |  |  |
| DR. Uthman Baroudi  SECN 04 | □ UMTW 8:10 am  |  |  |
| DR. Uthman Baroudi  SECN 05 | □ UMTW 9:20 am  |  |  |
| DR. Uthman Baroudi  SECN 06 | □ UMTW 10:30 am |  |  |
| DR. Hamzah Luqman  SECN 07 | □ UMTW 9:20 am |  |  |
| DR. Hamzah Luqman  SECN 08 | □ UMTW 10:30 am |  |  |

**Instructions**:

1. Answer all questions. Make sure your answers are **clear** and **readable**.
2. The exam is closed book and closed notes. No calculators or any helping aides are allowed. Make sure to turn off your mobile phone and keep it in your pocket.
3. If there is no space on the front of the page, use the back of the page. Indicate this clearly.

|  |  |  |  |
| --- | --- | --- | --- |
| **Question** | **Maximum Points** | **Earned Points** | **Remarks** |
| **1** | **20** |  |  |
| **2** | **10** |  |  |
| **3** | **24** |  |  |
| **4** | **22** |  |  |
| **5** | **24** |  |  |
| **Total** | **100** |  |  |

**Question 1: 20 points (2 marks each)**

1. If grade is a variable of type double, what will be its value after executing the following statement?

 grade = 5/2;

1. 2
2. 2.0
3. 2.5
4. 3
5. none of the above
6. If sum is a variable of type integer, what will be its value after executing the following statement?

 sum = 84.8;

1. 84.8
2. 84.0
3. 84
4. 85
5. none of the above
6. The equivalent C expression to the following algebraic one is:

$$\frac{x}{y+z}-3$$

1. x / y + z -3
2. -3 + x / (y + z)
3. (x / y + z) - 3
4. (x – 3) / (y + z)
5. none of the above
6. Given the following declarations:

 double a = 16.238 ; int b = -70;

Which print statement produces the following output? (A square represents one space)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 6 | .  |  2 | 4 |   |  |  1 | 6 |  |  |  | - | 7 | 0 |  |

1. printf("%2.2f%4.0f%6d", a, a, b);
2. printf("%5f%4f%6d", a, a, b);
3. printf("%5f%7f%6d", a, a, b);
4. printf("%7f%5f%3d", a, a, b);
5. Which of the following is a correct function call for a void function with two integer arguments?
6. myfunction(int a, b);
7. myfunction(int a, int b);
8. void myfunction( int a, int b);
9. myfunction(a, b);
10. Which of the following is the correct order of evaluation for the C operators in the expression shown below?

2 > 3 || a == b && !c \*3 < 4

1. >, ||, ==, &&, !, \*, <
2. !,\*, >, <, ==, &&, ||
3. \*, >, <, ==, !, &&, ||
4. \*, >, <, ==, &&, !, ||

7) What will be shown on the screen as a result of executing the following statements?

int a = 10, b = 20;

if (!a){

 b += 2;

if (b)

 a = --b + b++;}

printf("%d %d",a,b);

1. 10 20
2. 10 22
3. 40 20
4. 40 22

8) Which of the following is the correct C code for the formula: $a=\frac{-b+cd}{3b}$

1. a = (-b + c \* d) / 3 \* b;
2. a = -b + c \* d / 3 \* b;
3. a = (-b + c \* d) / (3 \* b);
4. a = (-b + ((c \* d) / (3 \* b));
5. What will be shown on the screen as a result of executing the following statements?

int A = 1, B = 0;

if (B = !A)

 printf("A");

if (!B)

 printf("B");

if ( B = A)

 printf("A=B");

 else

 printf("A!=B");

1. ABA!=B
2. ABA=B
3. BA=B
4. BA!=B
5. What will be displayed by the following program?

#include <stdio.h>

void a(void);

void b(void);

int main(void)

{

 a();

 b();

 return (0);

}

void b(void)

{

 printf("ICS103");

}

void a(void)

{

 printf("Hi");

}

1. HiICS103
2. ICS103Hi
3. Hi
4. ICS103
5. none of the above

**Question 2: 10 points (1 mark each)**

Find the values of the following expressions**.**

|  |  |
| --- | --- |
| expression | Value |
| 3>=!5 | 1 |
| 8\*4%3 | 2 |
| 4&&6<=5+1 | 1  |
| 2!=2!=3 | 1 |
| 8-4.5/3 | 6.5 |
| 1!=2>=0 | 0 |
| 1==3<1  | 0 |
| ! ( 0 != 3 ) | 0 |
|  ! ( 12 < 10 || 15 >= 15 ) | 0 |
| 2 < 4 || 1 == 1 && !89 \*3 < 5 | 1 |

**Question 3: 24 points (4 points each)**

What is the output of the following code fragments?

|  |  |
| --- | --- |
| Code fragment | Output  |
| int i=1 , j; do{for(j=i; j<3; j++) printf("%d %d\n", i,j); ++i;} while(i<4);printf("%d %d\n", i,j); | 1 11 22 24 3 |
| int a = 16; if( a = 8)printf("Hi\n");printf("Hello\n");if(a > 5)printf("There\n");elseprintf("Bye\n"); printf("See You"); | HiHelloThereSee You  |
| int x = 3; switch (x){case 2: printf("2"); break;case 3: printf("3"); x=20;case 5: printf("5"); break;  x=30;default: printf("5"); break;}printf("\nx = %d", x); | 35x = 20   |
| int i=4; int j;  while (i > 2) { for(j=3; j<=i; j++) printf("%d\n", i + j); i=i-2; }  printf("%d %d\n",i,j); | 782 5   |
| #include <stdio.h> int my\_fun(int x, int y);int main () { int x = 1, y = 2;  my\_fun(x,y); printf("%d %d\n", x,y); y = my\_fun(x,y); x = my\_fun(y,x); printf("%d %d\n", x,y);  return(0);} int my\_fun(int q, int r) { int y; return(q+r); }  | 1 24 3  |
| int i,j, cout = 0, cin=0;for(j=8; j>5; j--) { ++cout;for(i=1; i<=10; i++) cin++; }printf("%d %d", cout, cin); | 3 30  |

**Question 4: 20 points**

**Part 1: (7 points)**

Implement the following flowchart. Do NOT make any changes to the flowchart. Do NOT write a full program.

**K>89**

**K > 99**

**false**

**“middle”**

**“Low”**

**true**

**K>79**

**“Second”**

**“First”**

**false**

**K>70**

**true**

**true**

**true**

**false**

**false**

**Get K**

do{

 scanf(“%d”,&k);

 if(k > 89)

    if(k >99)

        printf("Low");

 else

        printf("Middle");

 else if(k > 79)

        printf("First);

 else if(k > 70)

        printf("Second);

}while(k<=70);

**Part 2: (6 points)**

Starting from variable declarations, write the necessary statements to find the product of all integer numbers divisible by 7 from 1 to 100 i.e. 7\*14\*21\*…….. . No need to print the product.

int i, product;

 product =1;

 for(i=7;i<=100;i=i+7)

 product = product \* i;

alternative solution:

int i, product;

 product =1;

 for(i=1;i<=100;i=i+1)

 if(i%7==0)

 product = product \* i;

**Part 3: (7 points)**

Convert the following switch-statement into if-else-if statement.

switch (i) {

 case 1: i=i-1;

 case 4:

 case 6: i=6\*i;

 break;

 case 3: i=i/4;

 default: i=i+2;

}

if ( i == 1)

{ i =i-1;

 i = 6\*i;

}

else if (i==4 || i==6)

{

 i= 6\*i;

}

else if (i==3)

{

 i=i/4;

 i=i+2;

}

else

 i=i+2;

**Question 5: 24 points**

**Part 1: (10 points)**

Write a C function ***ComputeSum*** to compute and return the result of this series:

$$y = \frac{x^{4}+2}{3}+\frac{x^{6}+3}{5}+\frac{x^{8}+4}{7}+\frac{x^{10}+5}{9}+ …$$

Your function will receive the value of x and the number of terms **n**, and it will return the value of **y**. Your function must be general and it must not contain **printf** and **scanf** statements.

Note:

* Don’t write the main function; you can use pow function.
* Assume x and y are of type **double**.
* You must use proper indentation.

double computeSum(double x, int n)

{

 double y=0;

 int i=4, j=2, k = 3;

 while(i<=n)

 {

 y = y + (pow(x, i) + j ) / k;

 i = i + 2;

 j = j + 1;

 k = k + 2;

 }

 return y;

}

**Part 2: (14 points)**

Write a C program to calculate the Body Mass Index (BMI) for each of n persons and display the weight category based on the BMI value. The BMI is calculated using the following formula:

$$BMI = \frac{Weight(kg)}{height(m)^{2}}$$

 The weight category is calculated based on the following table:

|  |  |
| --- | --- |
| **Weight category** | **BMI** |
| Underweight | < 18.5 |
| Normal | 18.5 – 24.9 |
| Overweight  | > 24.9 – 29.9 |
| Obese | > 29.9 |

First, the user will enter the number of persons and it must be greater than zero, otherwise, an error message is displayed and the user has to re-enter the number of persons again. Your program must keep asking the user to enter the number of persons until he enters a valid value (greater than zero). The program then calculates the BMI for each person and displays both the BMI and the weight category.

Note:

* If the entered weight for a person or his weight is zero or negative an error message is displayed as an output for that person.
* You must use meaningful variable names.
* You must use proper indentation in your program.

Sample program run:

|  |
| --- |
|  |

#include <stdio.h>

int main(void){

 double height, weight, BMI;

 int numPersons, k;

 do{

 printf("Enter number of persons: ");

 scanf("%d", &numPersons);

 if(numPersons < 1)

 printf("Invalid number, try again\n");

 } while(numPersons < 1);

 for(k = 1; k <= numPersons; k++){

 printf("Enter weight [kg] and height [m] of person#%d: ", k);

 scanf("%lf%lf", &weight, &height);

 if(weight <= 0 || height <= 0)

 printf("Error: Invalid input for person#%d\n", k);

 else{

 BMI = weight / (height \* height);

 printf("The BMI of person#%d is %0.1f and his weight category is ", k, BMI);

 if(BMI > 0 && BMI < 18.5)

 printf("Underweight\n");

 else if(BMI <= 24.9)

 printf("Normal\n");

 else if( BMI <= 29.9)

 printf("Overweight\n");

 else

 printf("Obese\n");

 }

 }

 return 0;

}