CS 210 - Introduction to Computer Science

Fall 2016 – Final Exam Review Sheet

Final Exam is Thursday, December 8 at 2:00pm

The exam is open book and open notes. The final is 2 hours long – all written – ***no practical***.

The exam will be comprehensive and similar in style to the previous hour exams. Material that will NOT be on the exam includes: files and formatted I/O.

The exam will be in three sections. Section 1 will consist of short answer questions. Section 2 will contain programs which you will be asked explain. In Section 3 you will be asked to write programs (design, analysis, and/or implementation).

At least one question will involve the design, analysis, and/or implementation of a program having recursion. Other likely topics for programs include two-dimensional arrays and strings.

Sample problems for review

1. Short answer questions will cover all topics. Some example short answer questions are given below:

a) If m = 24 and n = 7 what is the value of ++m - n--_____

b) if m = 6 and n = 19 is the following true or false: `((m ==6)||(!(m+n<20))___`

c) How many lines will the following program print? _____

```
int n = 7;
 while(n <= 15)
 {printf("%d\n", n);
  n+=2;
 }
```

d) How can you access the memory address of an integer?

e) Assuming a char takes 1 byte of memory how many bytes are required for the following variable:_____

```
char c[] = "Hello mom";
```

2. Show what is printed by the following program.

```
#include <stdio.h>
void Fun(int x, int y);
void Fun1(int z);
main()
 {int a = 7, b = 5;
  Fun1(a);
  printf("%d, %d\n", a, b);
  Fun(a, b);
  return 0;
 }
//
void Fun(int x, int y)
 {printf("%d\n", x + y);
  Fun1(x);
 }
//
void Fun1(int z)
 {printf("%d\n", z*z);
 }
```

Printed Results

_____

_____

_____

_____

_____

_____

_____

3.Write a function which will return the first value of y that exceeds 100 in the equation given by $y = (x + x^3) / (3x - 1)$. Your function should evaluate the equation for y starting at x = 1 and continuing in increments of 0.01. A sample calling statement for your function is given by

```
double z;
z = YFunction();
```

4. Write a program which inputs a single integer, x from the user. For $0 \le x \le 90$ call function F1 below and print its results. For $90 < x \le 180$ call function G1 below and print its results. Otherwise, print the word "Illegal".

```
double F1(int x)
 {double y;
  y = x*3.14159/180);
  return cos(x);
 }
//
double G1(int x)
 {double y;
  y = x*3.14159/180;
  return -cos(x);
 }
```

5. The program below uses a *switch* structure. Answer the following questions:

A) What does the program print if the number entered is a 9? _____

B) What does the program print if the number entered is a 0? _____

C) What does the program print if the number entered is a 1? _____

```
#include<stdio.h>
main()
 {int In, j = 2;
      printf("Enter an integer...");
      scanf_s("%d", &In);
      switch (In)
       {case 0:
          j = 9;
          printf("%d", j + In);
        case 1:
         printf("%d\n", In);
         break;
        default:
          printf("Error");
          break;
       }
  return 0;
 }
```

6. Write a program to find the sum of the rows of the matrix *a* below:

```
    1    2    3    4
    5    6    7    8
    9    10  11   12
   13    14  15   16
```

Print the sums in four lines as "Sum of row 1 = XXX"

7. Answer the questions below about the program which operates on the 4 x 5 array.

```
#include <stdio.h>
main()
 {int M[4][5];
  int i, j;
  for(i=0;i<4;i++)
   {for(j=0;j<5;j++)
     {M[i][j] = i;
      M[0][j] = 0;
     }
   }
  return 0;
 }
```

a) What values are stored in column 0? (List all) _____
b) What values are stored in row 1? (List all) _____
c) How many values are stored in the array?_____
d) What value is stored in the bottom right corner of the array?_____

8. Write a C program to input 3 integers and print them out in order (from highest to lowest) using the *if* statement to determine the order.

9. Write a C program that reads in a grade A, B, C, D, or F and prints out the words "excellent", "good", "fair", "poor", and "failure". Use a *switch* statement.

10. Write a program to calculate values of y from the equation $y = 3x^3 - 4x^2 + 23$. Your program should start with x = 0 and increment x in steps of .1 until the value of y exceeds 100. Print no value of y in excess of 100. Use a function to evaluate y.

11. Write a program that reverses the digits of a given positive integer.

12. A Babylonian algorithm for finding the square root of a number, x, iteratively replaces a guess by the average of guess and x/guess. That is, to find the square root of x, you set guess = (guess+ x/guess)/2. You continue doing this until guess is equal to the square root of x within some stated tolerance. Write a program to use the Babylonian algorithm to find the square root of 2 within a tolerance of 0.0001.

13. Write a function to swap two integers.

14. Write a function that returns the kth digit of the integer n. A typical calling statement might be

```
m = digit(n, k);
```

If n = 1234567 and k = 2, your function would return 6.

15. Write a program that fills an integer array with 100 random numbers (from 1 to 12) and prints their sum, average, maximum, and minimum.

16. Write a program to read in a line of text up to 80 characters in length and removes the letter "a" from the line.
17. Write a program to accept a single line of text up to 80 characters in length and determines if that line is a palindrome.

18. What is wrong with the following code.

```
main()
 {const double pi;
  int n;
  pi = 3.14159256358979;
  n = 22;
 }
```

19. Write a recursive program which calculates the sum of the terms in an int array from a variable called start to a variable called finish. You can assume that start is greater than or equal to 0 and finish is less than the number elements in the array. For example the following main program

```
int a[] = {1, 2, 3, 4};
cout << RecursiveSum(a, 1, 3);
```

will print 9 since 2+3 +4 = 9.