CS 2073 Computer Programming with Engineering Applications

Fall 2009 – Midterm1 -- Oct 1, 2009
You have 75 min. Good luck.

Name:…… Score: ……./20

1. (2pt) What is the difference between "`c1 = a % b;`" and "`c2 = a / b;`" in C language? What will be the values of `c1` and `c2` when `a` is 24, and `b` is 10?

2. (2 pt) Show how C will perform the following statements step-by-step and what will be the final output?

```
int a =  6,  b = -3,  c =  2;

c = a + b / c * (4 + a / 2 / (b+5)) - (a - b);

printf("Value of c = %d \n", c);
```

Step-by-step show how C performs the operations

Name:…….

3. (4 points) Complete the following C program which computes the following algebraic expression

$$Z = \frac{a_1 \frac{b_1}{b_2} + a_2 \frac{b_2}{b_1} - \sqrt{a_1 b_2}}{{a_2}^2 + \frac{a_1}{a_2}\frac{b_1}{b_2} + {b_2}^2}$$

```
#include <stdio.h>
#include <math.h>
int main(void)
{
   double a1, b1, a2, b2, Z;
  /* If you need more variables, you must declare them here */
```

```
   /*  Enter the values for a1 a2 b1 b2 */
   printf("Enter a1 a2 b1 b2 : ");
   scanf("%lf %lf %lf %lf", &a1, &a2, &b1, &b2,  );

   /* Write the C statement(s) for the above expression */
```

```
   /*  Print the result in the form of
            The value of Z is ... */
```

```
   return 0;
}
```

Name:……

4. (4 points) Complete the following C program that asks the user to enter an angel in terms of degree. It then computes the cosine and sine values for that angle. Note that trigonometric functions in math library assume that parameters are given in terms of radian, so you need to first convert degree to radian.

```
#include <stdio.h>
#include <math.h>
#define PI   3.14
int main(void)
{
   double angle_degree, angle_radian, cosvalue, sinvalue;
   /* If needed, you can declare more variables here */
```

```
   printf("Enter the angle in terms of degree: ");
   scanf("%lf", &angle_degree);

   /* Convert angle_degree to angle_radian,
      Compute cosine and sine,
      Print the results in the form of
               COS of …… degree is ……
               SIN of …… degree is ……                    */
```

```
   return 0;        /*  Exit program.  */
}
```

5. (4 points) Draw if-else flow chart and trace it
   a. (2pt) Draw the flow chart for the following nested if-else statement
   b. (2pt) Suppose that we have `a=5, b=3, c=1`. Find the new values of `a, b,` and `c,` after the execution of this if-else statement?

```
if (a+b < c) {
   c = a+2;
   if (c > 10)
     b = b+3;
   d = d+4;
} else {
   if (c+2 <= b){
      a = a + 2;
      b = b + 5;
   } else {
      c = c+2;
      if (c > 20)
         c=c-10;
   }
}
```

c. (4 points) Complete the following C program so that it can ask user to enter *t* from the keyboard and then it computes and prints the value of *p* which is expressed as a function of *t* by

$$p(t) = \begin{cases} 20 & \text{when} \quad 0 < t \le 2 \\ 4(t+2) & \text{when} \quad 13 < t \le 16 \ \text{ or } \ t > 30 \\ 4(t^2 + 2t) & \text{Otherwise} \end{cases}$$

```
#include <stdio.h>

int main(void)
{
   double t, p;        /*  Declare variables */

   /* Ask user to enter the value for t */
```

```
   /* Write if-else statements to compute p as a function of t */
```

```
   /* Print the result in the form of
              The value of p at t=…… is ……     */
```

```
   return 0;
}
```