

CS 2073 Computer Programming with Engineering Applications

Fall 2009 – Midterm2 - take home – Given on Nov 10, 2009

Return date: Nov 12, 2009 (3:30pm) in class

*I do solemnly and sincerely swear that I will solve this exam by myself and
DO NOT discuss or share my solutions with anyone else. Signature:*

Name:.....

Score:/20

1. (4pt) A quantity known as Body Mass Index (BMI) is computed by the formula

$$BMI = \frac{w}{h^2}$$

where w is the weight in kilogram and h is the height in meters. Based on BMI, we describe the health condition of a person as follows:

When BMI is less than 20, then the person is “under weight”.

When BMI is between 20 and 25, then the person is “healthy”.

When BMI is between 25 and 30, then the person is “overweight”.

When BMI is greater than 30, then the person is “obese”.

Using the above background information, write a program that asks user to enter his/her weight (w) and height (h), then the program computes and prints out the BMI value as well as the corresponding health condition using one of the above messages.

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

```
int main(void)
```

```
{
```

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

```
}
```

Name:.....

2. (4 points) What will be the output of the following C program? Also show how the values of each variable change in memory.

```
#include <stdio.h>

int main(void)
{
    int i, j;

    for( i=1; i<=6; i++ )
    {
        if (i%2==0)
            continue;

        for( j=1; j<=i; j++)
        {
            printf("* ");
        }

        j = i;
        while( j<=5 )
        {
            if (j%2 != 0)
                printf("+ ");
            else
                printf("o ");
            j++;
        }

        printf("\n");
    }

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


Suppose this is the screen.

Values of i :

Values of j :

Name:.....

3. (4 points) Complete the following C program that reads the value of x and n from the keyboard. Then it **computes** and **prints out** the value of the following math function:

$$funcx = 1 - \frac{x}{2} + \frac{3x}{4} - \dots + (-1)^n \frac{(2n-1)x}{(2n)}$$

```
#include <stdio.h>
#include <math.h>
int main(void)
{
    /* Declare variables, If needed, you can declare more*/
    int    i, n;
    double x, funcx;
```

```
printf("Enter the value of x and n : ");
scanf("%lf %d",&x, &n);
/* Write a loop to compute funcx using the above formula */
```

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

Name:.....

4. (4 points) Suppose a data file (say emp.txt) contains employee ID, how many days (s)he worked, and how many hours (s)he worked in each day. For example, here is a sample file with three employees (an actual file may have more employees):

11	4	5	8	2	7						
12	2	3	2								
13	10	2	4	4	3	5	4	3	5	2	4

Write a program that can read the above file and output the employee ID and average work hour per day for the employees whose average work hour per day is greater than or equal to 3 hours. For the above input file, your program should put the followings into output.txt:

11	5.5
13	3.6

```
#include <stdio.h>
int main(void)
{
    FILE *infp, *outfp;
    int ID, NumD, hour, i;
    /* declare other variables if you need */

    if ((infp = fopen("emp.txt", "r"))==NULL) {
        printf("Input file cannot be opened\n");    return 0;
    }
    if ((outfp = fopen("output.txt", "w"))==NULL) {
        printf("Output file cannot be opened\n");    return 0;
    }

    fclose(infp);    fclose(outfp);
    return 0;
}
```

Name :

5. (4 points) What will be the output of the following program making several function calls? Also show how the values of each variable change in memory

```
#include <stdio.h>

int myfunc(int a);

int main()
{
    int x = 4, y;

    y = myfunc(x) + myfunc( x+3 );

    printf("y is %d \n",y);

    y = myfunc( myfunc(15) );

    printf("y is %d \n",y);

    return 0;
}

int myfunc( int a )
{
    int b;

    printf("a is %d \n", a);

    b = a / 3;

    printf("b is %d \n", b);

    return b;
}
```

A blank 10x10 grid of squares, intended for drawing a picture.

Suppose this is the screen.

Values of x :

Values of y:

Values of a:

Values of b: