

CS 2073 Computer Programming with Engineering Applications

Spring 2008 – Midterm — March 10, 2008

Name:.....

Score:/20

Sequence number:.....

1. (4 point) Show the output line(s) generated by the following statements (also show how you perform the computations):

```
int a = 3, b = 6, c = 4;
```

```
c = a + -b / 3 - b / sqrt(b + a) + a / 2 * b;
```

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

Step-by-
step show
how you
compute:

output:

New value of c = 5

Name:.....

2. (4 points) Suppose a store XYZ is having a “BUY ONE, GET ONE 25% OFF” deal. Suppose every customer gets two items whose original prices are p1 and p2 dollars, respectively. The discount is applied to the lowest-cost item. Tax is 8% and applied after the discount. Complete the following C program that computes and prints the total amount to pay.

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

```
int main(void)
```

```
{
```

```
    /* Declare variables.  If needed, you can declare more*/  
    double p1, p2, total;
```

```
    printf("Enter the original prices of item1 and item2:");  
    scanf("%lf %lf", &p1, &p2);
```

```
    /*
```

```
    Compute the total amount including 8% tax
```

```
    Note: 25% off discount is applied to the lowest-cost item
```

```
    */
```

```
total = p1 + p2;
```

```
if( p1 > p2 ) {
```

```
    total = total - 0.25 * p2;
```

```
} else {
```

```
    total = total - 0.25 * p1;
```

```
}
```

```
total = total + total * 0.08;
```

```
printf("Total = %lf \n", total);
```

```
if( p1 > p2 ) {
```

```
    total = p1 + 0.75 * p2;
```

```
} else {
```

```
    total = p2 + 0.75 * p1;
```

```
}
```

```
system("pause");
```

```
/* Exit program. */
```

```
return 0;
```

```
}
```

3. (4 points) Suppose an Internet service provider has two different subscription packages for its customers:

Package A: \$9.95 per month for 10 hours of access. Additional hours are \$2.5 per hour.

Package B: \$13.95 per month for 20 hours of access. Additional hours are \$1.5 per hour.

Write a program that prints the following table to show monthly bill under each package for various number of access hours starting from 4 to 50 with increment of 2 hours, and to recommend the best package for that number of access hours.

AccessHours	PackageA	PackageB	Recommendation
4	9.950	13.950	Select A
6	9.950	13.950	Select A
8	9.950	13.950	Select A
10	9.950	13.950	Select A
12	14.950	13.950	Select B
...			
50	109.950	58.950	Select B

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

```
int main(void)
```

```
{
```

```
    /* Declare variables.
       If needed, you can
       declare more */
```

```
    int hour;
```

```
    double billA, billB;
```

```
    printf("AccessHours  PackageA  PackageB  Recommendation\n");
```

```
    printf("-----\n");
```

```
    for(hour=4; hour <= 50; hour+=2){
```

```
        if (hour <= 10 )
```

```
            billA=9.95;
```

```
        else
```

```
            billA = 9.95+(hour-10)*2.5;
```

```
        if (hour <= 20 )
```

```
            billB=13.95;
```

```
        else
```

```
            billB = 13.95+(hour-20)*1.5;
```

```
        printf("%d \t %7.3lf \t %7.3lf  ", hour, billA, billB);
```

```
        if(billA < billB)
```

```
            printf("Select A \n");
```

```
        else
```

```
            printf("Select B \n");
```

```
    } /* end of for */
```

```
    system("pause");
```

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

```
}
```

```
    billA=9.95;
```

```
    billB=13.95;
```

```
    for(hour=4; hour <= 50; hour+=2){
```

```
        if(hour > 10 )
```

```
            billA = 9.95+(hour-10)*2.5;
```

```
        if(hour > 20 )
```

```
            billB = 13.95+(hour-20)*1.5;
```

4. (4 points) Complete the following C program that reads the value of x and n from the keyboard and then approximately computes the value of $\cos(x)$ using the following formula:

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} \dots + (-1)^n \frac{x^{2n}}{(2n)!}$$

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

    double powx, fact;

    printf("Enter the value of x and n : ");
    scanf("%lf %d",&x, &n);

    /* Write a loop to compute cosx using the above formula */

    cosx=1.0;
    fact=1.0;
    powx=1.0;

    for(i=1; i<=n; i++){

        powx = powx * x * x;          /* OR  powx = pow(x, 2*i); */

        fact = fact * (2*i-1) * (2*i);

        if (i%2==0)
            cosx = cosx + powx / fact;
        else
            cosx = cosx - powx / fact;
    }

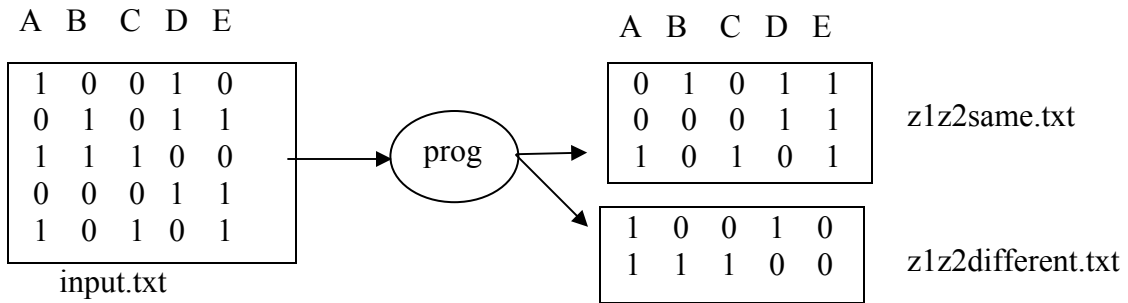
    printf("Approximate cosx is %lf when n=%d \n", cosx, n);
    printf("cos(x) in math lib returns %lf \n", cos(x));

    system("pause");
    return 0;          /* Exit program. */
}
```

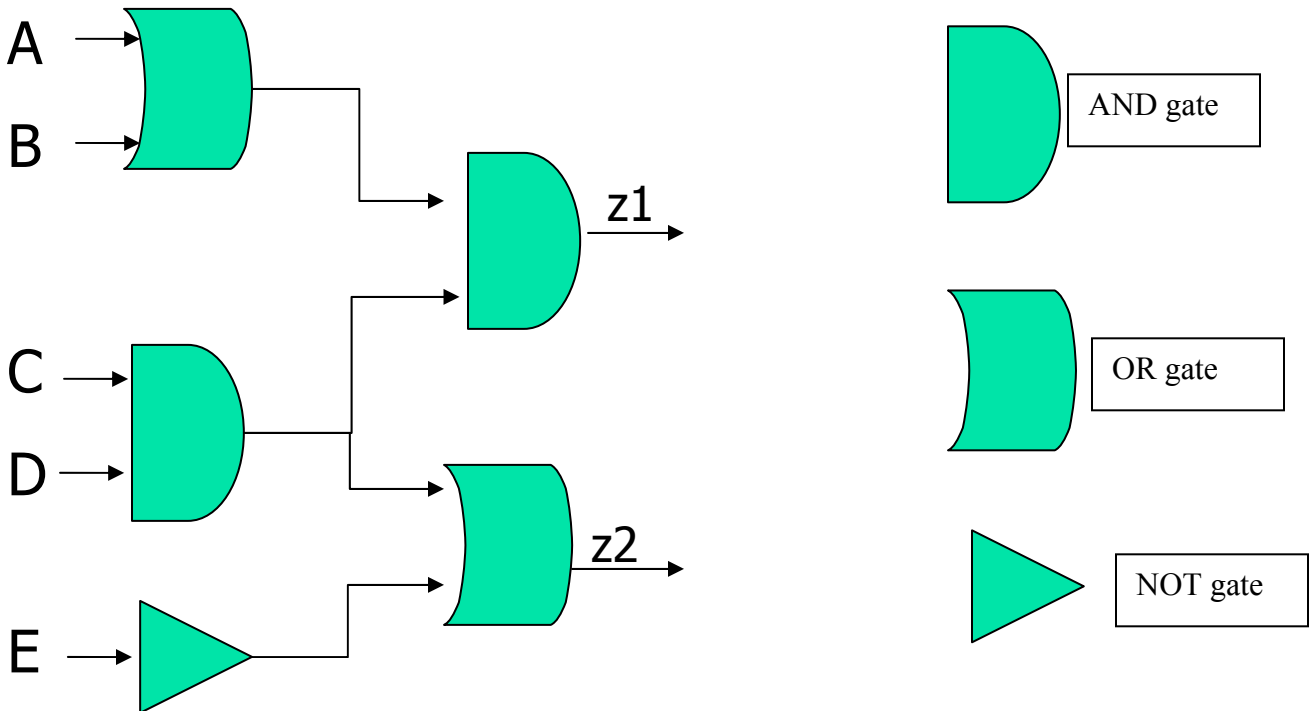
Name:.....

5. (4 points) Suppose we have a data file that contains various input combinations for the below logical circuit. We would like to divide these input combinations into two files such that the combinations resulting in the same z1 and z2 are written into z1z2same.txt and the combinations resulting in different z1 and z2 are written into z1z2different.txt.

For instance, your program should process the following input.txt and generate the corresponding z1z2same.txt and z1z2different.txt as follows:



Here is the logical circuit.



Complete the program in the next page →

```

#include <stdio.h>
int main(void)
{
    FILE *infp, *outsame, *outdifferent;;
    int    A, B, C, D, E, z1, z2;

    /* if you need, you can declare more variables */

    if ((infp = fopen("input.txt", "r")) == NULL) {
        printf("Input file cannot be opened\n");
        return 0;
    }
    if ((outfsame = fopen("z1z2same.txt", "w")) == NULL) {
        printf("z1z2same file cannot be opened\n");
        return 0;
    }
    if ((outfdifferent = fopen("z1z2different.txt", "w")) == NULL) {
        printf("z1z2different file cannot be opened\n");
        return 0;
    }

```

```

while(fscanf(infp, "%d %d %d %d %d",&A, &B, &C, &D, &E)==5) {

    z1 = (A || B) && (C && D);
    z2 = (C && D) || !E;

    if(z1==z2)
        fprintf(outsame, "%d %d %d %d %d\n", A, B, C, D, E);
    else
        fprintf(outdifferent, "%d %d %d %d %d\n", A, B, C, D, E);

}

fclose(infp);
fclose(outsame);
fclose(outdifferent);

```

```

return 0;
}

```