1. (20 points) Shown below is a program to determine the total price for a group to attend a movie. The program asks the user to enter the number of people in the group, the starting time of the movie and each person’s age. Note, movies start between 1:00PM and 8:00PM on the hour. To select a 1:00PM starting time, the user would simply enter 1, for a 7:00PM starting time the user would enter 7, etc. Answer the questions on the following page pertaining to this program.

```c
#include<stdio.h>

main()
{
    int age, time, count, n;
    float total_price = 0;

    printf("Enter number of people in your party: ");
    scanf("%i", &n);
    printf("Enter starting time of show: ");
    scanf("%i", &time);

    for (count = 1; count <= n; count++)
    {
        printf("Enter person's age: ");
        scanf("%i", &age);
        if (time < 4)
        {
            if (age > 12)
                total_price = total_price + 5.00;
            else if (age > 2)
                total_price = total_price + 2.50;
            else
                total_price = total_price + 0.00;
        }
        else
        {
            if (age > 12)
                total_price = total_price + 10.00;
            else if (age > 2)
                total_price = total_price + 5.00;
            else
                total_price = total_price + 0.00;
        }
    }

    printf("Total Price is $%.2f", total_price);
}
```
Circle the one correct answer to each of the following questions.

a) What total price would a family of four pay consisting of 2 adults, a 5 year old and a 2 year old at the 3:00PM show?

$15.00
$12.50
$10.00
$25.00
None of the above

b) An individual arrives to the movies and pays $10.00. This person would have the following characteristics.

Male, age 23, show time 8:00PM
Female, age 12, show time 8:00PM
Child, age 8, show time 1:00PM
Infant, age 1, show time 3:00PM
None of the above

c) An individual arrives to the movies and pays $5.00. This person would have the following characteristics.

Age 45, show time 2:00PM
Age 10, show time 8:00PM
Age 15, show time 3:00PM
All of the above
None of the above

d) You ask your date to accompany you to the movies. Your date already has plans to watch his/her 8 year old kid sister. You try to impress your date by agreeing to also take the kid sister to the movie. The kid sister loves popcorn and lemonade and won’t sit still without it. The cost for these snacks is $5.00. Assuming you and your date are 18 years old, what is the minimum amount of money that you need to bring?

$12.50 assuming that you go to the early show (3:00PM)
$17.50 assuming that you go to the early show (3:00PM)
$25.00 assuming that you go to the late show (7:00PM)
$35.00 assuming that you go to the late show (7:00PM)
None of the above
2. (15 points) What will be displayed by the following program? Pay attention to formatting in the printf statement.

```c
#include<stdio.h>
main()
{ /* begin main */
    int  a = 1, b = 2, c = 3, d = 7, e, f;
    double  alfa = 2.0, beta = 4.0, gamma = 5.0, delta, epsilon;

    delta = (a*b/c)*gamma;
    e = d%b;
    epsilon = (alfa*beta/gamma)*b;
    beta = (1/2)*beta;
    f = d/b;

    printf("\ndelta = %.2f
  e = %d
  epsilon = %.3f
  beta = %f
  f = %d " , delta, e, epsilon, beta, f);
} /* end main */
```

```plaintext
delta =
e =
epsilon =
beta =
f =
```
3. (10 points) The following program compiles with no error messages but produces a general exception fault when run. The student that wrote this program did not completely understand the relationship between declared variable types and input/output functions.

   a) What caused the general protection fault?

   b) After this problem is corrected the program displays incorrect results when executed. Why?

#include<stdio.h>
define PI 3.14159

main()
{ /* begin main */
   double radiusi, radiuso, area;

   printf(“
Please enter value for inner radius> ”);
   scanf(“%lf”, radiusi);

   printf(“
Please enter value for outer radius> ”);
   scanf(“%lf”, radiuso);

   area = PI*(radiuso*radiuso – radiusi*radiusi);

   printf(“
An annulus with an inner radius %d and outer radius %d”, radiusi, radiuso);
   printf(“
has an area of %d”, area);

} /* end main */
4.) (15 points) Show the output generated by the following program:

```c
#include<stdio.h>

main( )
{
    int x=3, y=1, k=1;
    do
    {
        y = y * x;
        printf("k = %d  y = %d \n", k, y);
        y = y – k;
        printf("k = %d  y = %d \n", k, y);
        k = k + 1;
    }
    while (k < 4);
}
```

5. (20 points) A student submitted the C program listed at the end of this question as a solution to the class homework assignment. Note that the lines are numbered for your convenience.

   a) What is the purpose of the variable `choice` in line 15?

   b) Is the `scanf` statement in line 29 written correctly? If not, what changes are required?

   c) What is the purpose of `toupper` in line 43?
d) Are the logical expressions in lines 23, 31 and 53 written correctly? If not, what changes are required?

Line 23

Line 31

Line 53


e) What does the variable i represent? (See lines 52, 55 and 60.)

f) Is the printf statement in line 60 written correctly? If not, what changes are required?

g) What is the purpose of the else statement in line 67? And what must happen for this to be used by the program?

h) Assume the program is corrected of any errors. What is the line number of the scanf that ends the while loop started in line 18?

```c
#include<stdio.h>
#include<math.h>
#include<ctype.h>
#define PI 3.14159265359
main()
{
    double    time, /* Time */
    volt,    /* Each voltage "term" value */
    volt_sum, /* Summing variable for voltage */
    volt_total, /* Total voltage */
    eps;    /* Epsilon error value */
    int    i, /* For looping index */
    n;    /* Max number of terms */
    char    ans, /* Main while variable */
    choice, /* Menu variable */
    answ1; /* Inner whiles' variable */
    ans = 'Y';
```
while (toupper(ans) == 'Y') {
    printf("n Please enter a choice from the following: ");
    printf("n N -- To calculate the voltage for a given n ");
    printf("n E -- To find the number of iterations knowing epsilon ");
    scanf(" %c", &choice);
    if (toupper(choice) == 'N') {
        answ1 = 'Y';
        while (toupper(answ1) == 'Y') {
            printf("n Enter the time to evaluate voltage at: ");
            scanf(" %lf", &time);
            printf("n Enter the number of terms to evaluate: ");
            scanf(" %d", &n);
            volt_sum = 0;
            for (i=1; i<=n; i++){
                volt = 1/(pow((2*i-1),2)) * cos(((2*i-1)*PI*time)/3);
                volt_sum = volt_sum + volt;
            }
            volt_total = 3./2. - ((12./pow(PI,2))*volt_sum);
            printf("n The voltage for %d terms is %lf", n, volt_total);
            printf("n Do you wish to do this part again? (Y/N): ");
            scanf(" %c", &answ1);
        }
        printf("n Do you wish to run the program again? (Y/N): ");
        scanf(" %c", &ans);
    } else if (toupper(choice) == 'E') {
        answ1 = 'Y';
        while (toupper(answ1) == 'Y') {
            printf("n Enter the time to evaluate voltage at: ");
            scanf(" %lf", &time);
            printf("n Enter a value for epsilon: ");
            scanf(" %lf", &eps);
            volt_sum = 0;
            volt = 1;
            i = 0;
            while (fabs(volt) >= eps) {
                i = i + 1;
                volt = 1/(pow((2*i-1),2)) * cos(((2*i-1)*PI*time)/3);
                volt_sum = volt_sum + volt;
            }
            volt_total = 3./2. - ((12./pow(PI,2))*volt_sum);
            printf("n The voltage for epsilon %lf is %lf and took %d iterations", &eps, &volt_total, &i);
            printf("n Do you wish to do this part again? (Y/N): ");
            scanf(" %c", &answ1);
        }
        printf("n Do you wish to run the program again? (Y/N): ");
        scanf(" %c", &ans);
    } else {
        printf("n Not a valid choice: ");
        ans = 'Y';
    }
    printf("n The End!");
}