ENGR0012/0112 - Spring 2003
Final

Your Name _____

Section: **Leonard (10 am)** **Lund (noon)** **Budny (2 pm)**
Patzer (10 am) **Vasko (noon)**

Please write neatly and show all of your work. Adequate space for your response has been provided following each question. If you need additional room, turn to the backside of the page or ask the instructor for paper. Good luck!

Question	Points Available	Points Awarded
1	20	
2	40	
3	20	
4	15	
5	20	
6	20	
7	10	
Total	100	

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1) (20 points) Write the screen display for the following script and associated function in the space provided.

```
% script
x = 4
y = 3
z=[2 4 5 3 1];
for i=1:2:5
   if i <= 2
      out1=confuse2(i,x,y,z)
   elseif i > 3
      confuse1(i,x,y,z)
   else
      out2=confuse3(i,y,x,z)
   end
end
```

```
function  confuse1(j,a,b,c)
y1=j*3/b+a^2/2-4
```

```
function  new2 = confuse2(j,y,x,k)
for i=1:3:5
   new2(i)=confuse3(i,x,y,k);
end
```

```
function w=confuse3(j,d,s,k)
switch (k(j))
   case {1,2}
      w=d+9
   case {3,4}
      w=2*s
   otherwise
      w=d+s
end
```

Display #	Display
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2) (40 Points) The following program is one solution to your programming assignment 12. It is written with function calls from main(). The function calls (underlined and in bold) are as shown. Referring to both the function calls and the function definitions (provided without prototype), write appropriate function prototypes and definitions in the space provided.

```
#include<stdio.h>
#include<math.h>
#define  MAXSIZE  50
// PROTOTYPES:

_____// enter prototype for header

_____// enter prototype for getxydata

_____// enter prototype for getangle

_____// enter prototype for interp

_____// enter prototype for displayresults

_____// enter prototype for goagain

//*****************************************
main()
{ // begin main
  // variable declarations
        double  lift[MAXSIZE], angle[MAXSIZE];
        int numpts;
        double  liftangle, liftest;
  // algorithm
        header();
        // get lift data
                getxydata( angle, lift, &numpts );
        // estimate lift given angle
                do
                { // begin do..while
                        liftangle = getangle( );
                        liftest = interp( liftangle, angle, lift, numpts );
                displayresults( liftangle, liftest );
                } while ( goagain( ) == 1 );

} // end main
//*************************************************************************

_____header(_____)       // complete fcn definition
{       // begin header
        printf("\nThis is an exam question!!!!\n\n" );
}   // end header


_____ displayresults(_____)          // complete fcn definition
{ // begin displayresults
        printf( "\n\nLift angle = %.3lf", liftangle );
        printf( "\nEstimated lift = %.3lf", liftest );
} // end displayresults
//
```

```
_____getxydata(_____________________________________________)   // complete fcn definition
{ // begin getxydata
  // variable declaration
        FILE  *pInfile;
  // algorithm
        pInfile = fopen("liftdata.dat", "r");;
        *pnumpts = 0;
        while ( fscanf(pInfile," %lf %lf",&x[*pnumpts],&y[*pnumpts] ) == 2 ){
                *pnumpts = *pnumpts+1;  } // end while
        fclose(pInfile);
} // end getxydata


_____getangle(_____________________________________________)   // complete fcn definition
{ // begin getangle
  // variable declaration
        double  angle;

  // algorithm
        printf( "\n\nPlease enter angle for lift estimate ==> " );
        scanf( "%lf", &angle );

        return( angle );
} // end getangle


_____interp(_____________________________________________)   // complete fcn definition
{ // begin interp
  // variable declaration
        double  y, slope;
    int  i;
  // algorithm
        if ( x <= xvec[0] ) {
                y = yvec[0]; }
        else if ( x >= xvec[npts-1] ) {
                y = yvec[npts-1];}
        else  {
                i = 0;
                while ( x > xvec[i] ) {
                        i = i+1;  }
                slope = (yvec[i]-yvec[i-1])/(xvec[i]-xvec[i-1]);
                y = yvec[i]+slope*(x-xvec[i]);  }

        return(y);
} // end interp


_____goagain( _____________________________________)   // complete fcn definition
{ // begin goagain
  // variable declaration
        int  choice;
  // algorithm
        printf( "\n\nAnother estimate? 1 = yes, 2 = no  ==> " );
        scanf( "%d", &choice );
        return( choice );
} // end goagain} // end goagain
```

3) (20 Points) The following program is to get a list of numbers from the user and then display the list to the screen. The list must be displayed as

list[0] = first value input
list[1] = second value input
etc

The program code to get the list of numbers is provided. You are to provide the code to display the list of numbers using a function called **displaylist**. You must write the prototype, the calling statement, and the code in the spaces provided.

```
#include<stdio.h>
#define  MAXSIZE  20
// prototypes
        void  getdata( int vec[ ], int *pvecsize );


_____//enter displaylist prototype
//*************************************************
main()
{ // begin main
  // variable declaration
        int  list[MAXSIZE];
        int  listused;
        getdata( list, &listused );

_____// enter call to displaylist
} // end main
//*************************************************
void  getdata( int vec[], int *pvecsize )
{ // begin getdata
  // variable declaration
        int  flag=1;
  // algorithm
        *pvecsize = 0;
        do
        { // begin do..while
                if ( flag == 1 );
                { // begin if
                        printf( "\nEnter value ==> " );
                        scanf( "%d", &vec[*pvecsize] );
                        *pvecsize = *pvecsize+1;
                } // end if
                printf( "\nEnter another value? 1 = yes, 2 = no  ==> " );
                scanf( "%d", &flag );
        } while ( flag == 1 );
} // end getdata
//*************************************************
//Write code for function displaylist here
```

4) (15 Points) Your are in the process of creating a program which performs matrix manipulations on square matrices. The first operation you want to include is matrix addition. The code for the main program is shown below. A prototype statement for a function called "addmat", which must determine matrix C by adding matrix A to matrix B, has already been specified.

Based on the structure of the prototype statement, complete the following instructions in the spaces provided within the program:

1) Specify the correct call statement to this function
2) Write an appropriate function definition (header)
3) Write the line(s) of code which adds the corresponding matrix elements of A and B, and assigns the result to C (using the array pointer variables defined in the function).
4) Write the line(s) of code which prints each element of the resulting matrix using 10 spaces and 2 places of precision

```
/*********************************************************************/
#include<stdio.h>
#define N 3             //Maximum matrix dimension

// Function Prototypes
void addmat(int matdim, double inmat1[ ][N], double inmat2[ ][N], double outmat[ ][N]);

void main(void)
{ /* begin main */

        int dim = 3;        //identifies dimension of square matrices
        double          A[ ][N ] = {1, 2, 3, 4, 5, 6, 7, 8, 9};   //MATRIX A
        double          B[ ][N ] = {9, 8, 7, 6, 5, 4, 3, 2, 1};   //MATRIX B
        double  C[N][N];   //MATRIX C, result of operation chosen



_____ // Enter function call statement
} /*end main */

/*********************************************************************/
/*  Function "addmat"                                                */


_____// Enter function definition
{
        int i, j;
        for (i=0; i<matdim;  i++)
        {
                for (j = 0; j < matdim;  j++)
                {

                _____ // Enter code to add matricies


                _____ // Enter code to print matricies
                }
                printf("\n");
        }
}
```

5) (15 Points) Respond to the following:

a. Write the line of code which defines a global constant named **SIZE** with a value of 10…

b. Write one line of code which declares a one dimensional array called ***fractions*** that contains numbers of type double, and which is initialized to have 10 elements equal to zero…

c. Write the code which assigns the value 3.333 to the seventh element of the array fractions …

d. Given the array ***fractions*** as defined and modified above, what is the output of the following piece of code (*Pay attention to formatting*)?

```
for (x = 5; x <= SIZE-2; x=x+1)
   printf("fractions[%d] = %lf\n", x, fractions[x]);
```

g. What prints when the following group of C statements are executed as part of a larger program. You may assume that the larger program is correctly initialized?

```
char s1[20] = "green";
char s2[20] = "hamburgers";
char s3[15] = "and"

printf("%s\n%c%c%c%c\n%s\n%c%c%c\n",
    s1,s2[7],s2[6],s2[6],s2[9],s3,s2[0],s2[1],s2[2]);
```

6) (20 Points) The C program shown below is supposed to read several Fahrenheit-scale temperature values from the keyboard, convert each temperature to Celsius, and write the converted Celsius temperatures to a data file called "ctemps.dat." The process is supposed to continue until the sentinel 9999 is entered from the keyboard.

The program contains *six* ***error***s of which you are to find *five*. The lines are numbered 1-21 for you convenience Circle each line number that contains an error, label it, and write the corrected version of each line at the bottom of the page.

```
1    /* Fahrenheit to Celsius temperature conversion */
2    #include <stdio.h>
3
4    main()
5    {
6    double F, C;
7    FILE fpt;
8    fpt = fopen("ctemps.dat", "r");
9    /*  enter first temperature */
10   printf("\nTemperature, in degrees F: ");
11   scanf("%lf", F);
12   while (F != 9999) {
13   C = (5.0 / 9.0) * (F - 32.0);
14   fprintf("Temperature, in degrees C: %lf\n", C);
15   /* enter next temperature */
16   printf("\nTemperature, in degrees F: ");
17   fscanf("%lf", &F);
18   }
19   printf("\nBye, Have a Nice Exam!");
20   fclose("ctemps.dat");
21   }
```

Corrected error 1

Corrected error 2

Corrected error 3

Corrected error 4

Corrected error 5

7) (10 points) Write the screen display for the following script and associated function in the space provided.

```
#include <stdio.h>
void confuse4(float *pa, float *pb);
main()
{
        float a=3.2, b=5.1, temp;
        printf("a = %f  b= %f\n",a,b);

        confuse4(&a, &b);
        printf("a = %f  b= %f\n",a,b);
}

void confuse4(float *pa, float *pb)
{
        float temp;
        temp=*pa;
        *pa=*pb;
        *pb=temp;
}
```

Display #	Display
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