Université d'Ottawa
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Faculty of Engineering

School of Information
Technology and Engineering

GNG1106/1506
Final Examination
December 11th, 2010

Time allowed: 3 hours
Closed book examination
Non-programmable calculators are allowed

Attempt all questions
Questions carry the weights indicated
The total number of points for the examination is 100

Answer the questions in the spaces provided
Use both sides of these sheets if necessary

Examiners: Mohamad Eid and Fadi Malek

Name: _____ **Student Number:** _____

Part 1:	35	
Part 2:	35	
Part 3:	30	
Total:	100	

⇐ Do not write in this box!

Number of pages: 15

Part 1 – Short Answer Questions (35 points)

(a) In C, which character is used to terminate a character string? (2 points)

(b) The following table of integers is called `matrix`: (2 point)

10	90	12	13	5
91	-3	68	9	10
14	45	77	11	-55

What values do the following elements contain? (Write answer next to the question

```
a. matrix [2][2]

b. matrix [0][1]

c. matrix [2][3]

d. matrix [2][4]
```

(c) Write a C statement that generates a random number between 5 and 10 inclusively. Store the random value into a variable named `guess` (3 point)

(d) Write a C statement that assigns the address of the floating-point variable `salary` to a pointer called `salaryPtr`? (2 point)

(e) What is the effect of the following statements to the file system (assume no error occurs during execution): (2 points)

```
FILE *fPtr;
fPtr = fopen("exam.dat","w");
fclose(fPtr);
```

(f) Given the following structure declaration (6 points):

```
struct item
{
char desc[20];
int num;
float cost;
};
struct item inventory[25], *itemPtr;
```

a. What is wrong with the following statement? Provide a possible correction to the statement.
```
item[1].cost = 92.32;
```

b. What is wrong with the following statement? Provide a possible correction to the statement.
```
inventory.cost[10] = 32.12;
```

c. What is wrong with the following statement? Provide a possible correction to the statement.
```
itemPtr.num = 15;
```

(g) Assume the following declaration for the array `table`: (5 points)

```
int i, j,  table[3][3] = {{0,0,0},{1,1,1},{2,2,2}};
```

Write C code that prints the array data in tabular format (each row on separate line).

C Code

(h) Provide the output of the following C code in the adjacent box. (5 points)

```
# define COL 4
# define ROW 3

int main( )
{
   int i, j;
   i = ROW;
   while (i>0)
   {
       j = 0;
       while (j<i)
          {
           printf("*");
           j++;
          }
       printf("\n");
       i = i - 1;
    }
}
```

Output Screen

(i) Provide Visual Basic for Applications code (that runs in the Microsoft Excel application) to:

- Assign a random integer number between 0 and 10 to the cell (A1) in the third sheet of an Excel file. (2 points)

- Read 10 integer values from the first row of the first Excel sheet (cells A1 to J1) and store them in the array *dataArr* (use a For/Next loop structure). Compute the average and store the result in the cell (A2). (3 points)

- Prompt the user for a student ID and search if this ID exists in the first 100 cells of the first column of sheet 1. Print a message to the user whether the grade was found or not. (3 points)

Part 2 – Analysis Questions (35 points)

(a) Write, in C code, the complete function definition (named poly) that accepts a float number and returns the value of a polynomial given by the following formula: (6 points)

$$9x^3 - 15x^2 + x$$

C Code

(b) Provide the output of the following C code in the adjacent box? (6 points)

```
main()
   {
   int x=50, y=70;
   interchange1(x,y);
   printf("First : x=%d y=%d \n",x,y);
   interchange2(&x,&y);
   printf("Now: x=%d y=%d",x,y);
   }

void interchange1 (int x, int y)
   {
   int z = x;
   x=y;
   y=z;
   }

void interchange2 (int *x, int *y)
   {
   int z = *x;
   *x=*y;
   *y=z;
   }
```

Output Screen

(c) Write C code that prompts the user for a file name and copy the contents of the file to another file, named "Copy.dat". Print "File copied …" if the copy process is successful, and "File does not exist" otherwise. Be sure not to leave any open files after the code has executed and the file data should not be altered or deleted (Also make sure that you make all proper declarations whenever needed). Use the back of this page if more space is needed. (9 points)

C Code

(d) Provide the C instruction(s), in the box below, for the following pseudo-code (assume variables are already declared): (7 point)

Assign "GNG1106" to name
Assign "PASS" to key

If username is equal to name AND password is equal to key
    Print "User authenticated"
Otherwise
    Print "Not authenticated"

C Code

(e) Provide the output of the following C code in the adjacent box? (7 points)

```
#include <stdio.h>
#include <string.h>
#define LEN 10
void print1(char *, int );
void print2(char [][], int, int);

/*-----------------------------------------------*/
int main( )
{
   char days[7][LEN] = {"Monday","Tuesday","Wednesday",
            "Thursday","Friday","Saturday","Sunday"};

   print1(days[1], 4);
   print2(days, 4, 3);
   return (0);
}

/*-----------------------------------------------*/
void print1(char *ptr, int size)
{
   char day[LEN]= "";

   strcpy(day, ptr);
   *(day+size) = '\0';
   puts(day);
}

/*-----------------------------------------------*/
void print2(char ptr[][LEN], int index, int size)
{
   char day[LEN]= "";

   strcpy(day, ptr[index]);
   *(day+size) = '\0';
   puts(day);
}
/*-----------------------------------------------*/
```

Output Screen

Part 3 – Case Study (30 points)

A battery production company is creating software to translate measurement data for 12V DC batteries into a set of specifications. Measurement data for each battery is stored in a binary file in separate structure values. A software program must be developed to repeat the following for each structure value in the binary file:

- read the structure value from the file into a structure variable,
- complete the battery specifications using the measurement data in the structure variable;
- store new specifications in the structure variable,
- save the updated structure variable contents into another file.

Please review the partial software report provided in the exam annex (focus mainly on understanding the information in Steps 1 and 2 of the report). Then read each of the following questions carefully and return to the annex to obtain the necessary information to answer each question.

Question a: Test cases (6 points)

Provide the objectives of three different test cases to test the software. You do NOT need to provide a detailed presentation of each test case; just provide a short statement on the objective of the test cases you are proposing. Ensure that each of the three test cases test a different aspect of the software.

Question b (8+5 points): Translate the provided pseudo-code for sub-programs *openOutputFile* and *computeRatings* to C functions.

```
openOutputFile( )
        Repeat
                Print "Please give the name of the output file: "
                Read string into fileName
                Open fileName for reading with pointer fPtr
                If fPtr does not equal NULL
                        Close file with pointer fPtr
                        Print "File ", fileName, " exists - do you wish to overwrite (y/n)"
                        Read character into answer
                        If answer equals 'y'
                                Open file fileName for writing with pointer fPtr
                                If fPtr equals NULL
                                        Print "Cannot open file ", fileName, " for writing"
                        Otherwise
                                Assign NULL to fPtr
                Otherwise
                        Open fileName for writing with pointer fPtr
                        If fPtr equals NULL
                                Print "Cannot open file ", fileName, " for writing"
        While fPtr equals NULL
        Return fPtr
```

```
/*-----------------------------------------------
Function: openOutputFile
-----------------------------------------------*/
FILE *openOutputFile()
{









}
```

computeRatings(specsPtr)

computePeukert(address of dMeasures referenced by specsPtr,
address of n, address of cp)

Assign computeCapRating(n, cp, 5) to c5hr referenced by specsPtr

Assign computeCapRating(n, cp, 20) to c20hr referenced by specsPtr

Assign computeRC(n, cp) to rc referenced by specsPtr

```
/*-----------------------------------------------
Function: computeRatings
Description: This function uses the contents of the member dMeasures
             structure variable to update the c5hr, c20hr and rc members. It
             calls computePeukert to obtain values of n and Cp  It uses these
             values in calls to computeCapRating for updating c5hr and c20hr,
             and to computeRC for updating rc.
-----------------------------------------------*/
void computeRatings(SPECS *specsPtr)
{









}
```

Question c (7+4 points): Provide the pseudo-code for the sub-programs *openInputFile* and *computerPeukert*. DO NOT give C code.

- *openInputFile*: This sub program prompts the user for the name of the input file (complete name including extension). The user is prompted until an existing file can be opened. The function returns the file pointer.

openInputFile( )

computePeukert: With the values referenced by a pointer to a DISCHARGE structure value (*mPtr*), the values for Peukert's exponent *n*, and Peukert's capacity *cp* are calculated, and stored in values pointed to by *nPtr* and *cpPtr*.

computePeukert(mPtr, nPtr, cpPtr)