UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE AND ENGINEERING

APS 105 — Computer Fundamentals
Midterm Examination
October 17, 2013
6:15 p.m. – 8:00 p.m.
(105 minutes)

Examiners: J. Anderson, B. Korst, J. Rose

Exam Type A: This is a "closed book" examination; no aids are permitted.

Calculator Type 4: No calculators or other electronic devices are allowed.

All questions are to be answered on the examination paper. If the space provided for a question is insufficient, you may use the last page to complete your answer. If you use the last page, please direct the marker to that page and indicate clearly on that page which question(s) you are answering there.

You must use the C programming language to answer programming questions. You are not required write #include directives in your solutions. You may use any math function that you have learned, as necessary.

The examination has 14 pages, including this one.

Circle your lecture section (**one mark deduction** if you do not correctly indicate your section):

L01	**L02**	**L03**	**L04**	**L05**
Rose	Korst	Korst	Anderson	Rose
Monday 2 PM	Monday 9 AM	Monday 11 AM	Monday 11 AM	Monday 4 PM

Full Name: _____

Student Number: _____ UTORID: _____

MARKS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
/2	/2	/2	/2	/2	/2.5	/2.5	/2.5	/2.5	/6	/6	/6	/6	/6	/50

Question 1 [2 Marks]

Given a `char` type variable named `c` that has already been declared and initialized to a value, write a relational expression that evaluates to TRUE if and only if `c` is an upper or lower case letter of the English alphabet.

Question 2 [2 Marks]

Correct the errors in the following complete C program to produce the intended output shown below.

```
#include <stdio.h>

int main(void)
{
  int i = 0;
  for (; i <= 4; i+);
  {
    printf("****");
  }
  return 0;
}
```

Intended output:

```
****
****
****
****
```

Question 3 [2 Marks]

A line in two-dimensional x, y Cartesian space can be expressed as $y = mx + b$, where m is the slope of the line and b is the intercept of the line with the y-axis. Given that `m` and `b` (representing the slope and intercept) are `double` type variables that have already been declared and initialized, and given that `y1` is a `double` type variable that has already been declared and initialized to represent a position on the y-axis. Write a single C statement that declares and initializes a `double` type variable `x1`, such that `x1,y1` represents a point on the line. You may assume that `m` is non-zero.

Question 4 [2 Marks]

Suppose that `i` is an `int` variable with value 3, and `j` is an `int` variable with value -2. Please evaluate the following expression (to `true` or `false`).

Expression	Answer
(i != j)	
(j)	
((i > 3) && (j < 0))	
((i > 3) || (j < 0))	

Question 5 [2 Marks]

Consider the following C statements:

```c
int i = 2;
int j = 2;
int *p = &i;
int *q = &j;
i++;
j--;
*p = *q + 2;
*q = *p + 3;
p=q;
*p = *q + 1;
```

Enter the values of the variables i and j after the execution of the statements in the following table:

Variable	Answer
i	
j	

Question 6 [2.5 Marks]

What does the following program print?

```c
#include <stdio.h>
int main (void) {

    int n = 1;

    do {
        printf("*%d",n);
        if (n % 3 == 0) printf("\n");
        n++;
    }

    while (n < 7);

    return 0;
}
```

Answer:

Question 7 [2.5 Marks]

Write what the following program will print.

```c
#include <stdio.h>

int main(void){

    int i=5, j=0, k=3;

    i *= j;
    i *= k;

    k++;

    printf("%d-%d-%d", i, j, k);

    return 0;
}
```

Answer:

Question 8 [2.5 Marks]

What does the following program print?

```c
#include <stdio.h>

int main(void){

    int num=0;
    char letter= 'a';

    for (;num<=4;){
        letter++;
        printf("%d*%c\n", num++,letter);
        }

    return 0;
    }
```

Answer:

7

Question 9 [2.5 Marks]

Determine the values of the variables W, X, Y and Z *after* the function **SumEm** executes in the main program of the following C program:

```c
#include <stdio.h>

void SumEm (int *A, int B, int C, int *D) {

    if (B > C) {
        *A = B + *D;
        *D = C;
    }
    else {
        *A = C + *D;
        *D = B;
    }

    return;
}

int main (void) {

    int W, X, Y, Z;

    W = 0;
    X = 5;
    Y = 8;
    Z = 10;

    SumEm(&W,X,Y,&Z);

    return 0;
}
```

Answer:

W =

X =

Y =

Z =

Question 10 [6 Marks]

Write a complete C program to rotate the values of three integer variables: a, b and c. Their initial values are 1, 2 and 3, respectively. This program **must** make use of a function called *rotateVar*, which you are to write as well, and will be the function called to effect the rotation of values. All variables should be *local* variables. The output should print:

- *b* taking the initial value of *c*

- *c* taking the initial value of *a*

- *a* taking the initial value of *b*

Answer:

Question 11 [6 Marks]

Write a C program that calculates the sum of all of the numbers from 1 to 1000 that obey **ALL** of the following conditions:

(a) The number is divisable by three.

(b) The number is odd.

(c) The ten's digit of the number is NOT 5. (e.g. the ten's digit in 753 is 5, and the ten's digit of 681 is 8; the ten's digit of the number 9 is 0)

Answer:

Question 12 [6 Marks]

Write a *complete* C program that prompts the user for an `int` type variable `n` and then computes and prints a value from the individual digits of `n` in the following manner: The least-significant digit d contributes d to the value. The next digit e contributes e^2 to the value. The next digit f contributes f^3 to the value, and so on. For example, if the integer entered is 156, the value computed is: $6 + 5^2 + 1^3 = 32$. Below is a sample execution of the program. Your output should conform to this format.

```
Enter an integer: 2145
The computed value is: 38
```

Question 13 [6 Marks]

Write a program to print the days of the month in a calendar format. The program is to take as inputs a number corresponding to the month, and a number corresponding to the weekday in which the first day falls. The days must be displayed in rows from Sunday to Saturday. If the first day of the chosen month does not fall on a Sunday, blanks should be used for the days preceding the first day. You are to indicate with comments within the program the number of blanks you are printing in order to align your output properly. There is no need to print the names of the week days, or to test for leap years.

Months with 31 days: January, March, May, July, August, October, December.
Months with 30 days: April, June, September, November.
Month with 28 days: February.

Below is a sample of the input and output of the program.

```
Enter the number corresponding to the month (1=Jan, 12=Dec): 10
Enter the starting day of the week (1=Sun, 7=Sat): 3
         1  2  3  4  5
  6  7  8  9 10 11 12
 13 14 15 16 17 18 19
 20 21 22 23 24 25 26
 27 28 29 30 31
```

Answer:

Question 14 [6 Marks]

You are to write a C language function called **Combo** that takes in three parameters: The first two parameters are character variables **C1** and **C2**, and the third is an integer, **N**.

The characters C1 and C2 are guaranteed to be capitals only, and that C1 comes before C2 in the alphabet.

Your function must print exactly **N** three letter 'words' that only use the range of letters from C1 to C2 in all three positions.

In addition, none of the letters that are printed in any given word can be the same.

If N is larger than the number of possible such words, then the program should simply print all possible words.

One word should be printed per line.

Note that there may be different ways to select the letters in the words that meet the specifications given above; any allowable three letters are ok, as long as they meet the specifications.

Answer:

This page has been left blank intentionally. You may use it for answers to any questions.