CMPE 108 - Experiment 3
Selective Structures

OBJECTIVES:

- Understand how to edit, compile and execute C computer codes.
- Understand C programming: sequential and selective structures

NOTES:

- You should prepare the preliminary work before coming to the laboratory session and bring soft or hard copies of the preliminary work with you.
- Before writing a computer code, you should do the following steps:
  1) understand and analyze the problem,
  2) develop an algorithm and/or flowchart,
  3) convert the algorithm and/or the flowchart into a C code.

PRELIMINARY WORK:

1. What is the output of the following C code fragments?

a)
```
int a=9, b=4;
float c,d;
c = a/b;
d = (float)a / (float)b;
printf("c=%.2f,d=%.2f",c,d);
```

b)
```
int    i = 5;
float  j = 314.15;
char   cr = '$';
printf("%5i", i);
printf("%6.1f", j);
printf("%f", j);
printf("%.1e", j);
printf("%10.2e", j);
printf("%c", cr);
```

c)
```
int x, a = 5, b = 10;
x = a++ + b++;
printf("x=%d\na=%d\nb=%d\n",x,a,b);
```

d)
```
int x, a = 5, b = 10;
x = ++a + ++b;
printf("x=%d,\n a=%d\nb=%d\n",x,a,b);
```

e)
```
int x, a = 5, b = 10;
x = a++ + --b;
printf("x=%d,\n a=%d\nb=%d\n",x,a,b);
```

```
f) int a = 3, b = 5;
a += b;
printf("a=%d\n b=%d\n",a,b);
```

```
g) int a = 3, b = 5;
a += b++;
printf("a=%d\n b=%d\n",a,b);
```

```
h) int a = 3, b = 5;
a *= b -(b / 2);
printf("a=%d\n b=%d\n",a,b);
```

```
i) int a=3, b=5, c=4;
a += b -= --c * 2;
printf("a=%d,\n b=%d \nc=%d\n",a,b,c);
```

```
j) float x = 4;
x += 2 / 3;
printf("x=%lf\n",x);
```

```
k) float x = 4;
x += 2.0 / 3;
printf("x=%f\n",x);
```

```
l) float x = 4;
x += (float)2 / 3;
printf("x=%f\n",x);
```

```
m) int a = 5, b = 8;
a = b;
b = a;
printf("a=%d\n b=%d\n",a,b);
```

```
n) int a = 5, b = 8, temp;
temp = a;
a = b;
b = temp;
printf("a=%d\n b=%d\n",a,b);
```

2. What is the out of the following C code fragments for the following declarations?
```
    float x;
    int i,j,k;.
```

```
a) i=5; j=2;
   if(i=50||j==2)
     printf("%d",i-j);
```

```
b) i=5; j=2;
   if(i==50||j==2)
    printf("%d",i-j);
```

c)
```
i=1;j=1;k=1;
k+=-i++ + ++j;
printf("%d %d %d\n", i,j,k);
```

d)
```
i=1;j=2;x=3.0;
x/=j=++i*2.5;
printf("%f %d %d\n",x,i,j);
```

e)
```
i=1;j=2;x=3.0;
x/=j=i++*2.5;
printf("%f %d %d\n",x,i,j);
```

f)
```
i=-1; j=3;
k = ++i&&--j;
printf("i = %d j = %d k = %d\n",
          i, j, k);
```

g)
```
i=-1; j=3;
k = i++&&--j;
printf("i = %d j = %d k = %d\n",
            i, j, k);
```

h)
```
i=-1; j=0;
k = i++||--j;
printf("i = %d j = %d k = %d\n",
            i, j, k);
```

i)
```
i=6;j=1;k=3;
k=i<j<k;
printf("i = %d j = %d k = %d\n",
        i, j, k);
```

j)
```
j=9;k=2;
i=j%k?++j:++k;
printf("j = %d k = %d\n", j, k);
```

k)
```
i=1, j=3;k=7;
i = (i < j)% j
printf("i = %d j = %d k = %d\n",
            i, j, k);
```

l)
```
i=1, j=5;k=7;
i=--i && --j || --k
printf("i = %d j = %d k = %d\n",
        i, j, k);
```

m)
```
i=1, j=5;k=7;
k= (++i +4)/(--k - j--)
printf("i = %d j = %d k = %d\n",
        i, j, k);
```

3. Write separate C programs to evaluate the given program fragments and write the produced outputs in the corresponding boxes. Use the following declarations:

```
int a, b, c, sum;
a=3, b=5, c=4, sum=0;
```

a)

```
if (b%a)
   {
     if (a>b)
         printf("a is greater");
     else
         printf("b is greater");
   }
```

b)

```
if (b%a)
   (a>b) ? printf ("greater a") : printf("greater b");
```

c)

```
(a>b)?sum=a+b:(a<c)?sum=a+c:sum=a+b+c;
printf("sum is %d\n", sum);
```

d)

```
if (a>b)
   {
      sum= a+b;
      printf("sum is %d\n", sum);
   }
else if (a<c)
   {
      sum= a+c;
      printf("sum is %d\n", sum);
   }
 else
   {
     sum= a+b+c;
     printf("sum is %d\n", sum);
   }
```

4. Rewrite the following using if-else-if structure.

```
switch(i){
case 0: k+=i;break;
case 1: k*=i;break;
case 2: case 3: k/=i;break;
default: k%=i;
}
```

TASKS during the LAB hours:

1. Write an `if` statement that computes and prints the circumference or the area of a square using the formulas:
```
circumference = 4* side
area = side * side
```

Enter the value of integer variable `side` from the keyboard. Assume that if `user_request` is 1, the program finds the circumference and prints and if it is 2, the program finds the area and prints.

2. Write a program for the following problem. An instructor needs a program that accepts student identification number `std_id` and three exam grades, `exam1`, `exam2` and `final_exam` for a course, as input and then determines and outputs for the student, the semester average and the final letter grade of the course according to the following table:

Semester Average	Letter Grade
90-100	A
80-89	B
70-79	C
60-69	D
0-59	F

The semester average for the student is computed using the following formula:

```
semester_average = 0.20 * exam1 + 0.30 * exam2 + 0.50 * final_exam
```

Student identification numbers are integers but not 0 or negative numbers. The program should print an appropriate message when 0 or negative number is entered for the student identification.

A session of the program should have the following appearance:

```
Enter student id_no: 1100
Enter exam grade 1: 70
Enter exam grade 2: 80
Enter final exam grade: 100
Semester average for student 1100:  88
Letter grade for student 1100   : B
```

If 0 or negative number is entered for student identification:

```
Enter student id_no: 0
Student id_no is  wrong.
```

3. Consider the following quadratic equation:
$$A*X^2 + B*X + C$$
Then, the roots of this equation can be obtained as
```
X1 = (-B + SQRT(Disc))/(2*A)
```

```
     X2 = (-B - SQRT(Disc))/(2*A)
```
where the discriminator **(Disc)** is given by
```
     Disc = B² - 4*A*C
```

a) Write a C program that will read the value of the inputs A, B, and C, and then check for the following conditions and do the corresponding tasks:
   ➢ If **Disc > 0,** then find the roots **X1** and **X2** and then display the result as,
      The roots are different: X1=…….. X2=………
   ➢ If **Disc = 0,** then find the roots **X1 and X2** and ten display the results as
      The roots are equal: X1 = X2=……….
   ➢ If **Disc <0,** then display the following message:
      The roots are imaginary.

b) Re-write the same code by using switch statement rather than if/else.