ENT 189 COMPUTER PROGRAMMING

LAB-2 LOGICAL AND REPETITIVE STRUCTURE

Lecturer : Mdm. Humairah binti Mansor
Teaching Engineer : Mdm Sharifah Nurul Husna binti Syed Hanapi
Technician : Mdm. Siti Khalijah Binti Hasan @ Yusuf

Name : _____

Matric Number : _____

Program : Mechatronic Engineering

ENT 189 COMPUTER PROGRAMMING

LAB-2 LOGICAL AND REPETITIVE STRUCTURE

Lecturer : Mdm. Humairah binti Mansor
Teaching Engineer : Mdm Sharifah Nurul Husna binti Syed Hanapi
Technician : Mdm. Siti Khalijah Binti Hasan @ Yusuf

Name : _____

Matric Number : _____

Program : Mechanical Engineering

OBJECTIVE

At the end of this lab students should reach the below objectives:

1. Able to develop simple problems using 'if' structure, 'if-else' structure.
2. Able to represent nested loop structure and switch structure.
3. Able to develop simple programs using repetitive structure.

TASK 1

Write a program to compute the roots of a quadratic equation ($ax^2 + bx + c = 0$). The roots of the equation can be calculated using the following formulae:

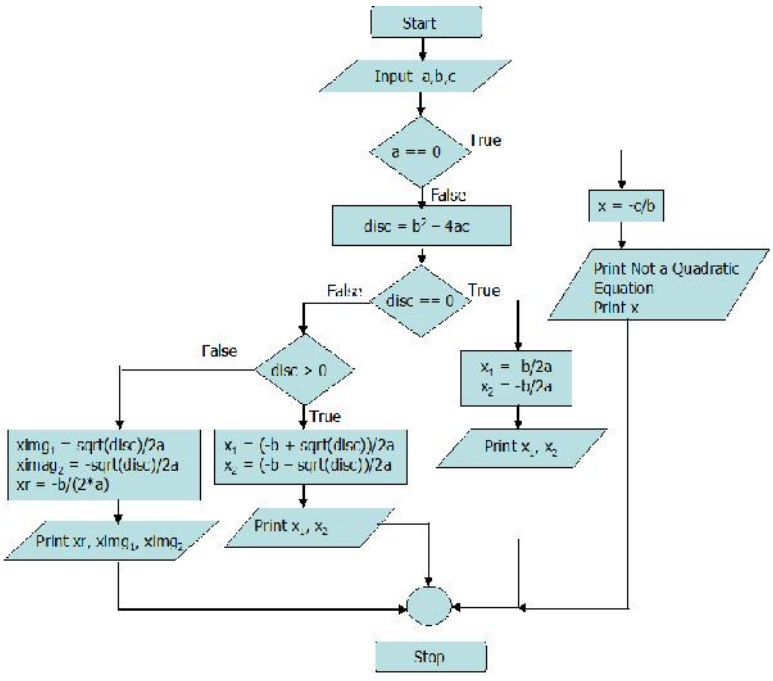
$$x_1 = (-b + \text{sqrt}(b^2 - 4ac))/2a$$
$$x_2 = (-b - \text{sqrt}(b^2 - 4ac))/2a$$

Note: If $b^2 - 4ac$ is negative, the roots are complex.

Write your program in the space provided. Using gedit, type and save your program. Test your program to solve the following equations:

(a) $x^2 + 7x + 12 = 0$
(b) $2x^2 + x + 1 = 0$
(c) $x^2 - 4x + 4 = 0$

A flow chart to solve the problem is shown below.



TASK 2

Some measures of interest in statistics are the arithmetic mean (a_m), geometric mean (g_m), harmonic mean (h_m) and variance (v) defined for a set of numbers $x_1, x_2, x_3, \ldots, x_n$ as follows:

$$a_m = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad g_m = \frac{1}{n}\prod_{i=1}^{n} x_i \qquad h_m = \frac{n}{\sum_{i=1}^{n}\frac{1}{x_i}}$$

$$v = \frac{1}{n}\sum_{i=1}^{n} x_i^2 - \frac{1}{n^2}\left(\sum_{i=1}^{n} x_i\right)^2$$

Write a program in C to read a set of data and compute the arithmetic mean, geometric mean, harmonic mean and variance. Test your program with the following data set:

12.0, 11.9, 13.8, 12.6, 10.2, 14.8, 21.0, 13.0, 12.5, 12.9

TASK 3

Consider a DC - RC transient circuit with the supply voltage V as 12 V, the resistance *R* = 5 Ohms and the capacitor value is 0.01 µF. The current (*i*), voltage across the resistor (V_R) and the inductor (V_C) in the RC series circuit are given by the following expressions:

$$i = \frac{V}{R}(e^{-\frac{t}{RC}}) \qquad V_R = V(e^{-\frac{t}{RC}}) \qquad V_c = V(1 - e^{-\frac{t}{RC}})$$

V is the applied voltage in Volts.
R is the circuit resistance in Ohms.
C is the Capacitance in farad.
t is the time in seconds.

Write a program in C to read in the circuit parameters and compute the current, voltage across the resistor and the inductor when the time is varied from 0 to 20.0 sec in steps of 1.0 sec using (a) while loop (b) for loop. Execute your program and tabulate the results. Which method is advantageous? State the reason for your answer.