Lab 03 : Selection Control Structures

I. Overview and Objectives

In many programming projects there are steps that may be necessary only if certain conditions are met, in the same manner, sometimes a condition dictates that steps can be bypassed. Selection control structures, like the if and switch statements in C are used to accomplish that goal.

The learning objective of this lab is to become familiar with selection statements in C.

Reading and related topics: Course slides lesson 04. Book chapter 4.

II. Lab Tasks and Submission Guideline

Write complete C programs to solve the following three problems. Save the code you wrote to solve them, together with the result of it in a report. Make sure you include enough comments in your code.

For each problem, copy and paste the source code, copy and paste the execution results of each of the scenarios (screenshots are acceptable) into your lab report. Save your report in .pdf format and submit it on D2L. You should submit your lab at the end of your lab session or soon after. In all cases it must be submitted before the deadline indicated in the D2L dropbox or it will not be accepted for marking.

Problem 1: The following are formulas for calculating the training heart rate (THR):

$$THR = (MHR - RHR) \times INTEN + RHR$$

where MHR is the maximum heart rate.

For males:

$$MHR = \frac{203.7}{1+e^{0.033(age-104.3)}}$$

For females:

$$MHR = \frac{190.2}{1+e^{0.0453(age-107.5)}}$$

RHR is the resting heart rate, and INTEN the fitness level (0.55 for low, 0.65 for medium, and 0.8 for high fitness).

Write a program that determines the THR. The program asks users to enter their gender (male 'M' or female 'F'), age (number), resting heart rate (number), and fitness level (low 'L' , medium 'M', or high 'H'). The program then displays the training heart rate (rounded to the nearest integer).

Use the program for determining the training heart rate for the following three individuals:

(a) A 19-year-old male, resting heart rate of 64, and medium fitness level.

(b) A 20-year-old female, resting heart rate of 63, and high fitness level.

(c) A 63-year old male, resting heart rate of 82, and low fitness level.

Problem 2: Body mass index (BMI) is a measure of obesity using a person's height and weight. The formula is BMI = kg/m^2 where *kg* is a person's weight in kilograms and *m*^{2} is their height in metres squared. The BMI classification chart is:

BMI	Classification
Below 18.5	Underweight
18.5 to 24.9	Normal
25 to 29.9	Overweight
30 and above	Obese

Write a complete C program that calculates the BMI of a person. The program asks the person to enter his or her weight (in kilograms) and height (in metres).

The program displays the result in a sentence that reads: "Your BMI value is *BBB*, which classifies you as *CCCC*" where *BBB* is the BMI value rounded to the nearest tenth, and *CCCC* is the corresponding classification.

Use the program for determining the obesity of the following three individuals:

(a) A person 1.88 m tall with a weight of 81.5 kg.

(b) A person 1.55 m tall with a weight of 68 kg.

(c) A person 1.57 m tall with a weight of 94 kg.

Note: BMI is not used for muscle builders, long distance athletes, pregnant women, the elderly or young children.

Problem 3: The overall grade in a course is determined from the grades of 10 quizzes, 1 midterm, and a final exam, using the following scheme:

Quizzes: Quizzes are graded on a scale from 0 to 10. The lowest grade between the first and last assignments is dropped and the average of the nine remaining assignments constitutes 25% of the course grade.

Midterm and final exams: Midterm and final exams are graded on a scale from 0 to 100. If the midterm grade is higher than, or the same as, the grade on the final exam, the midterms constitute 35% of the course grade and the

grade of the final exam constitutes 40% of the course grade. If the final exam grade is higher than the midterm grade, the midterm constitutes 25% of the course grade and the grade of the final exam constitutes 50% of the course grade.

Write a complete C program to calculate the final grade. Execute your program using the following scenarios:

(a) Quiz grades: 9.5, 6, 4, 10, 7.8, 3.4, 9, 5.6, 9, 10, Midterm grade: 73, and Final exam: 84.

(b) Quiz grades: 9.5, 8.4, 9, 10, 7.8, 10, 9, 9.6, 9, 10, Midterm grade: 89, and Final exam: 81

(c) Quiz grades: 8.5, 8.5, 9, 8.5, 7.5, 7, 9, 9.5, 10, 10, Midterm grade: 80, and Final exam: 70

Have fun!