**MECH 452 - Mechatronics Engineering**

**Department of Mechanical and Materials Engineering**

**Faculty of Engineering and Applied Science, Queen’s University, Kingston**

**Group #24**

**Laboratory #42 - Introduction to the Universe and Everything**

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**Instructor Name:** Dr. Li

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**Summary:**

A prewired USB-Boarduino was used as an introduction to the Stack hardware and Arduino (IDE) software. Activities included: a) use of a digital multimeter (DMM), b) debugging of wiring errors and c) editing a supplied program to change its sequence of operations. *Example of a summary based on the Tutorial 1 exercise.*

**Program:**

A listing of the program ***Group2IntroSwitch*** used in the lab is given in **Appendix A**. The flowchart corresponding to this program is given as **Fig. 1**. *Update sentences for Lab 1. Plus a paragraph explaining the sequence of operations as keyed to the flowchart.* *Note citation of figure and appendix, which in turn are appropriately labelled.*



**Fig. 1.** Flowchart for the program ***Group24Introswitch REPLACE WITH LAB 1 FLOWCHART***.

**Results***:*

The answers to the questions from the lab are as follows:

1. I don't know.
2. I'm not sure.
3. Yes.
4. No.
5. Please refer to **Table 1.**

**Appendix A - Program Listing***: (8 pitch font, 2 column, single spaced, changes highlighted EXAMPLE USING TUTORIAL 1 PROGRAM. REPLACE WITH LAB 1 WITH YOUR CHANGES HIGHLIGHTED)*

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Group24Lab1IntroSwitch

Original by H. Fernando, 30/04/2013

Revised by B. Surgenor

- switched to single button, 03/06/2019

Program ready, green LED flashing.

Button press to start, all LEDs flash sequentially.

Button press again to stop, all LEDS flash together.

Press Reset button to restart program.

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// Pin Assignments

int GRN = 6; //green LED Pin

int YLW = 5; //yellow LED Pin

int RED = 4; //red LED Pin

int BUTTON = 8; //pushbutton (press=high)

// Set-UP routine runs once when you press reset:

void setup()

{

// initialize led pins as outputs.

pinMode(GRN, OUTPUT);

pinMode(YLW, OUTPUT);

pinMode(RED, OUTPUT);

//initialize button pins as inputs

pinMode(BUTTON, INPUT);

//initialize serial printout

Serial.begin(9600);

Serial.println(" ");

Serial.println("program ready");

}

// Main Program Loop

// the loop routine runs over and over again forever

void loop() {

//wait for white button press (and flash Green while waiting)

Serial.println("press button to start");

do{

digitalWrite(GRN, HIGH);

delay(125);

digitalWrite(GRN, LOW);

delay(125);

}while(digitalRead(BUTTON) == LOW);

Serial.println("program running");

Serial.println("press button again to stop");

//cycle through LED's until Red button is pressed

do{

turnOnLED(GRN);

delay(125);

turnOnLED(YLW);

delay(125);

turnOnLED(RED);

delay(500); // big pause at the end before repeating

}while(digitalRead(BUTTON) == LOW);

Serial.println("program stopped");

Serial.println("press reset button to run again");

//toggle Green and Yellow LEDs, Red LED stays on

turnOnLED(RED);

do{

digitalWrite(GRN, HIGH);

digitalWrite(YLW, HIGH);

delay(250);

digitalWrite(GRN, LOW);

digitalWrite(YLW, LOW);

delay(250);

}while(1); //run forever, press RESET to restart

}

//\*\*\*\*\*\*\*\*\*\*SUBROUTINE\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

//Turn on a single LED, and all other off

void turnOnLED(int COLOUR)

{

digitalWrite(GRN, LOW);

digitalWrite(YLW, LOW);

digitalWrite(RED, LOW);

digitalWrite(COLOUR, HIGH);

}