



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2012/2013**

COURSE NAME : MICROCONTROLLER  
APPLICATION

COURSE CODE : BER 4223 / BEX 44103

PROGRAMME : BEE

EXAMINATION DATE : JUNE 2013

DURATION : 2 ½ HOURS

INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

**Q1** The Arduino has rows of connectors along both sides that are used to connect to electronic devices and plug-in 'shields' that allow the Arduino to do more. However, the Arduino also has a single LED that you can control from your sketches. This LED is built onto the Arduino board and is often referred to as the 'L' LED. The program to make the Arduino's built-in LED blink's is shown in Figure Q1.

- (a) Evaluate the parts need to make the Arduino's built-in LED blink. (4 marks)
- (b) Explain clearly how to load the blink example. (4 marks)
- (c) Explain clearly how to save a copy of the blink example. (4 marks)
- (d) Explain clearly how to upload the blink example to the board. (4 marks)
- (e) Explain clearly how the blink example works. (4 marks)

**Q2** Figure Q2 shows how to change the brightness of an LED by using different values of resistor.

- (a) Evaluate the parts described in the Figure Q2. (4 marks)
- (b) Give 2 (two) reasons why you cannot directly connect an LED to a battery or voltage source. (4 marks)
- (c) Evaluate 2 (two) ways to tell which is the positive lead of the LED and which the negative lead. (4 marks)
- (d) Draw the breadboard layout using the  $270\Omega$  resistor. (4 marks)
- (e) Design a connection between the breadboard and Arduino for blinking the LED. (4 marks)

**Q3** Figure Q3 shows how to use a RGB (Red Green Blue) LED with an Arduino.

- (a) Evaluate the parts need to control the color of the LED. (4 marks)
- (b) Design an interface circuit between the breadboard and Arduino controller. (4 marks)
- (c) Write related code for testing the sketch that will cycle through the colors red, green, blue, yellow, purple, and aqua. (6 marks)
- (d) Pulse Width Modulation (or PWM) is a technique for controlling power. If this concept is used to control the brightness of each of the LEDs, sketch a diagram that shows the signal from one of the PWM pins on the Arduino. (6 marks)

**Q4** The eight LEDs and a Shift Register is given in Figure Q4.

- (a) Evaluate the parts shown in Figure Q4. (6 marks)
- (b) Draw the breadboard layout. (4 marks)
- (c) Sketch a diagram shows the 74HC595 Shift Register. (5 marks)
- (d) Write an Arduino code that is designed specifically for sending data to shift registers. (5 marks)

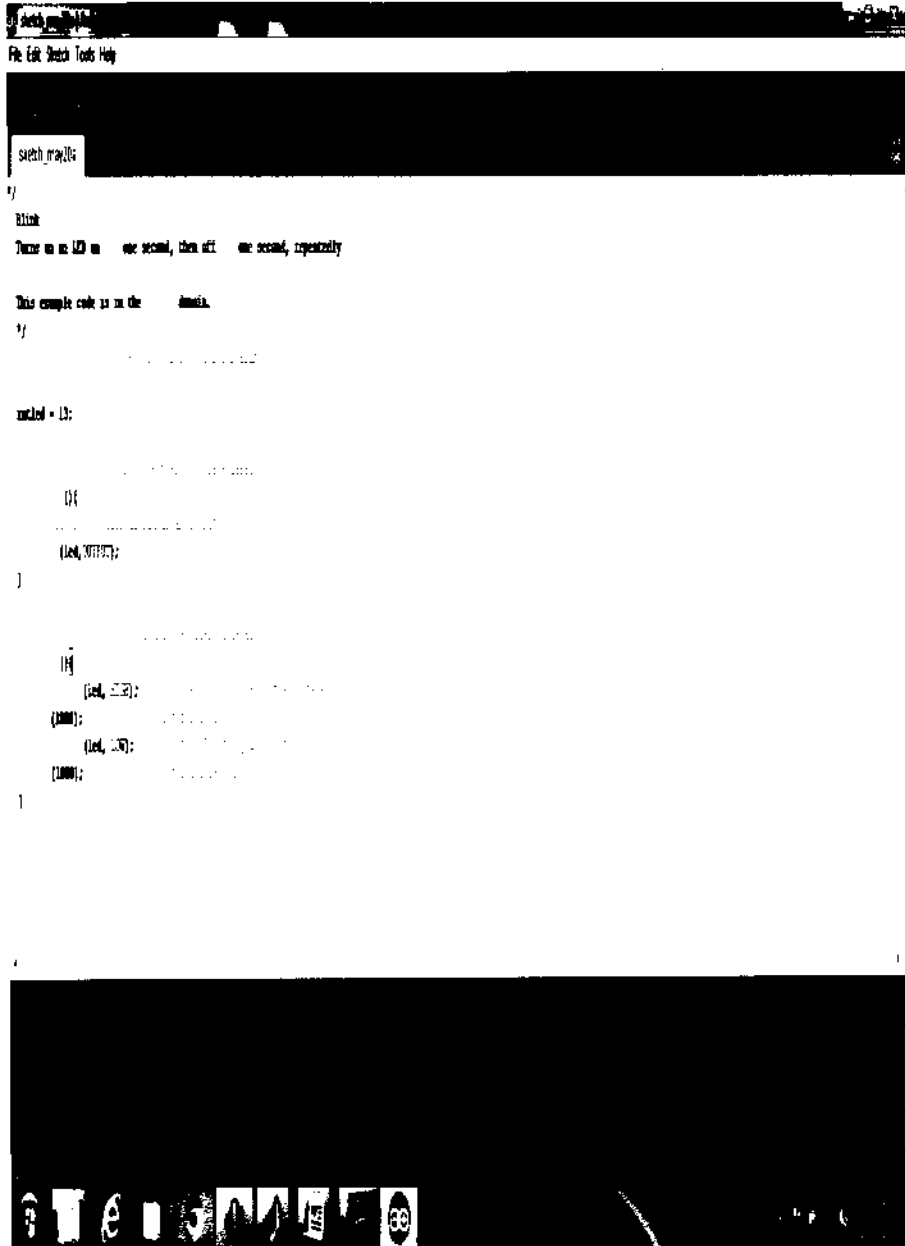
- Q5**
- (a) Design a schematic circuit for one shift register using arduino with 8 (eight) LEDs (10 marks)
  - (b) Design a schematic circuit for second shift register using arduino with 16 (sixteen) LEDs. (10 marks)

- END OF QUESTION -

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**FIGURE Q1**

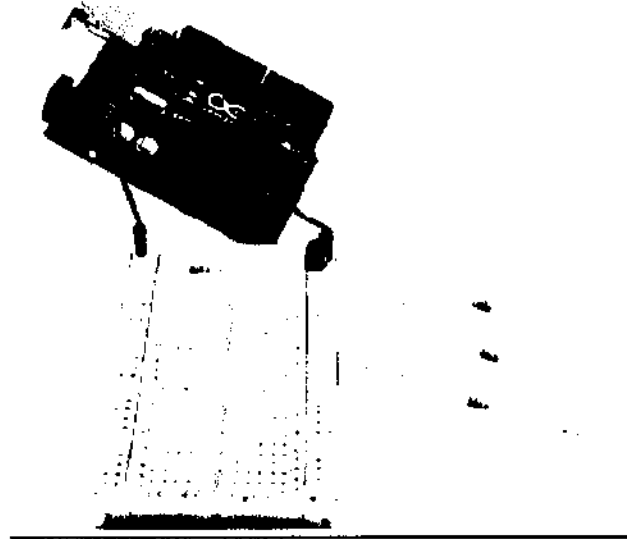
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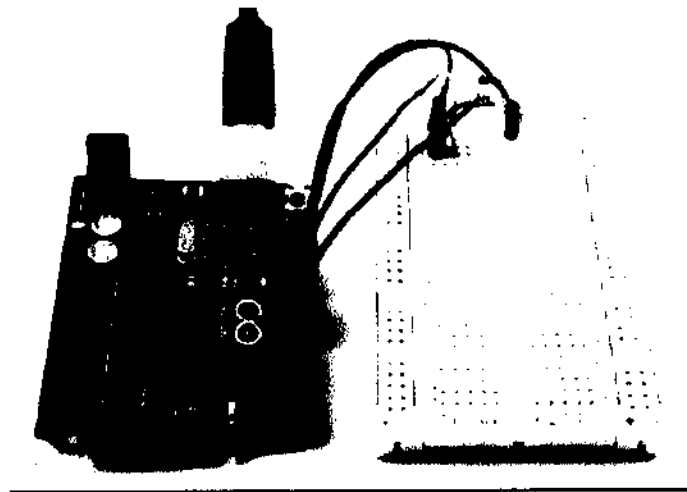
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**FIGURE Q2**



**FIGURE Q3**

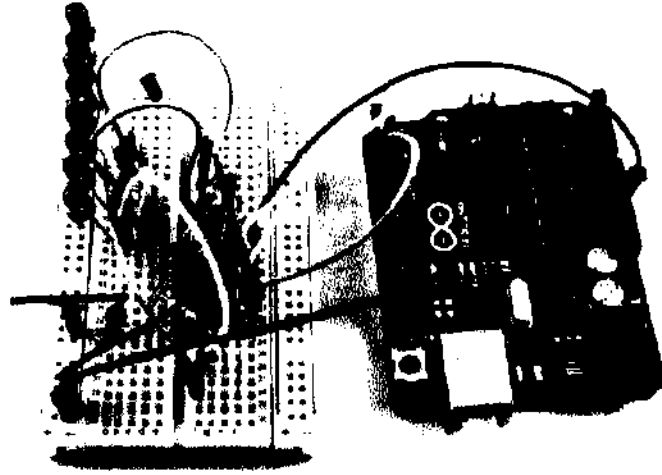
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**FIGURE Q4**