DUBLIN INSTITUTE OF TECHNOLOGY

DT211C BSc. (Honours) Degree in Computer Science (Infrastructure)

Year 3

DT228 BSc. (Honours) Degree in Computer Science

Year 3

SUMMER EXAMINATIONS 2015/2016

PROGRAMMING FOR SMART OBJECTS [CMPU3040]

MR RICHARD. LAWLOR

MONDAY 16TH MAY 4.00 P.M. – 6.00P.M.

QUESTION 1 IS **COMPULSORY**
ANSWER QUESTION 1 **AND** TWO OF THE OTHER THREE QUESTIONS

1. (a) Draw a schematic circuit diagram which shows how an Arduino board can be wired to read the temperature from a temperature sensor (TMP36).

Write a couple of lines of Arduino code to show how the temperature is calculated from the sensor output assuming a range of -50 to 450 degrees Celsius with a sensitivity of 10mV/degree.

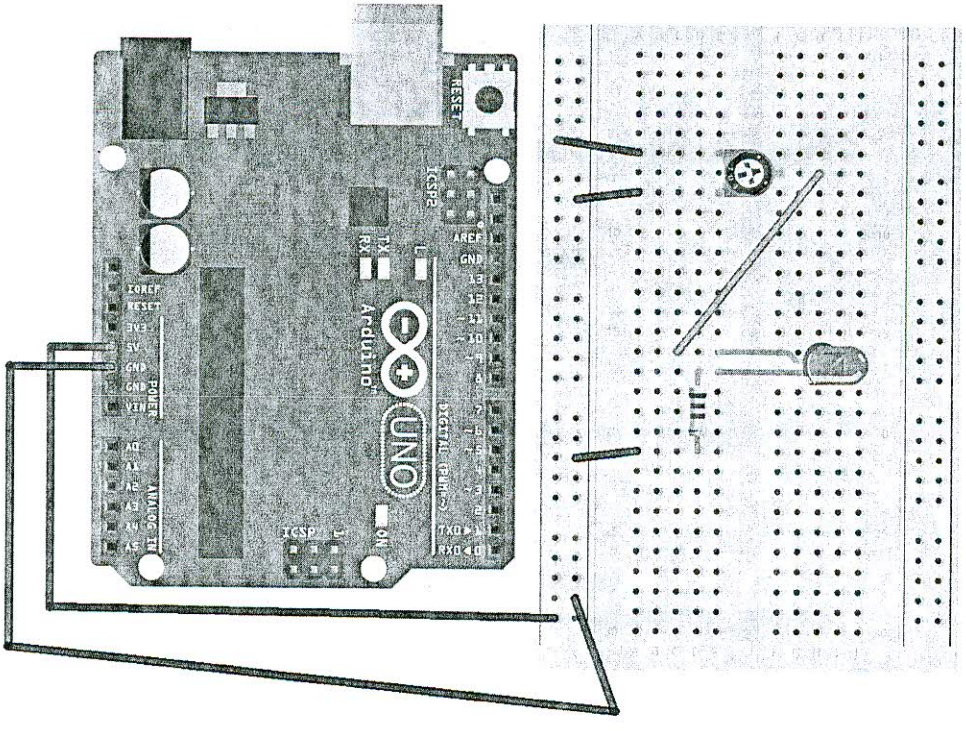
(10 marks)

(b) Briefly explain what the following electronic components are and what they can be used for (no circuit diagrams required):

- photoresistor
- potentiometer
- capacitor
- piezo speaker
- servo motor

(10 marks)

(c) Draw the following Arduino configuration as a schematic diagram and explain what it does given that the electronic components are: a 220 Ohm resistor, an LED and a potentiometer.



(10 marks)

(d) Assume that a wire has been added to the circuit in part (c) which connects the potentiometer output to pin A0. Write an Arduino sketch which reads the signal from A0, converts it to a voltage and sends the potentiometer output voltage over the serial port to be displayed in the Arduino IDE serial port console.

(10 marks)

(e) Briefly describe and contrast the following wireless technologies for use in the *Internet of Things*:

- WiFi
- ZigBee
- Mobile 3G

(10 marks)

2. Critically discuss the potential impact on society of the *Internet of Things* under the heading "The Creepy New Wave of the Internet". The discussion can be divided into a number of subheadings such as:

- openness & privacy
- security & hacking
- the Babel problem
- techno-utopia as in "The Internet of Things frees human beings from the market economy to pursue nonmaterial shared interests on the Collaborative Commons"

(25 marks)

3. **(a)** Explain what a Temboo Choreo is.

(8 marks)

(b) Describe, without the use of code, how you might get an Arduino Uno with a WiFi shield to regularly transmit time and temperature and humidity data to the cloud where it would be stored in a spreadsheet.

(5 marks)

(c) Write down the significant code fragments along with explanatory text, to illustrate how your description from part (b) could be implemented. You can assume 10 minute intervals in transmitting data.

(12 marks)

4. **(a)** Briefly explain what a transistor is and how it can be used.

(5 marks)

(b) Draw a simple schematic diagram to show how a transistor could be used in conjunction with a DC motor so that it controls the motor.

(5 marks)

(c) Suppose you were to modify your circuit from part (b) by connecting a potentiometer to an analog input, and use that input to PWM the pin that controls the transistor. What do you think would happen to the motor's speed if you vary the voltage it is getting?

Draw a circuit schematic for this arrangement and write an appropriate Arduino sketch.

(15 marks)