



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 2016/2017

PROGRAMING FOR SMART OBJECTS [CMPU3040]

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MONDAY 15TH MAY 4.00 P.M. – 6.00 P.M.

TWO HOURS

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)

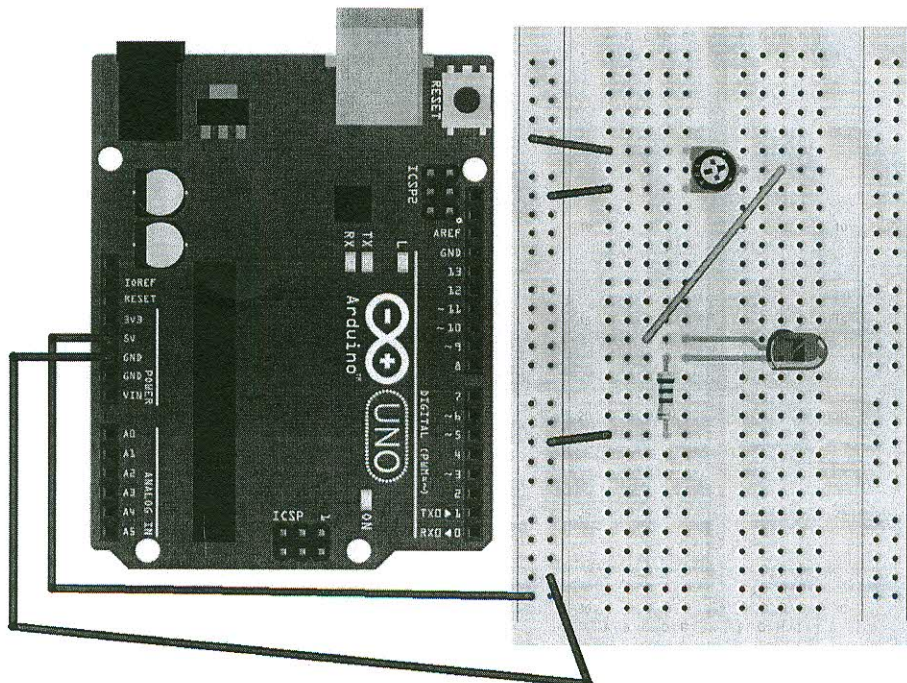
- (b) Briefly explain what the following electronic components are and what they can be used for (no circuit diagrams required):

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

(10 marks)

- (c) Given the following Arduino configuration, which uses a potentiometer's output as the LED input voltage, provide a schematic of a modified circuit so that the Arduino reads the potentiometer output and then uses it to calculate an output signal to the LED. The Arduino will supply the voltage to LED instead of the potentiometer.

Comment on the two approaches.



(10 marks)

- (d) Assuming the modified circuit you provided for part (c), write an Arduino sketch which reads the potentiometer output, 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 and also supplies it to the LED.

(10 marks)

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

- WiFi
- ZigBee
- RFID

(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.

(5 marks)

(b) Describe some of the preliminary security/authentication steps necessary so that a Temboo/Arduino app can append data to a Google spreadsheet.

(8 marks)

(c) Assuming that Google credentials have been setup, write down the significant code fragments along with explanatory text, to illustrate how sensor data can be appended to a Google spreadsheet. 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)