UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

Creative Design & Innovation

Term 3 – 2016/2017

Continuous Assessment Project 1

Teachers Notes

CONTENTS PAGES

IMPORTANT NOTE

There will be 2 projects used to grade students in continuous assessment during this term. In addition, there will be an examination towards the end of term. The CA is 70% of the term 3 grade and the EOT is 30% of the term 3 grade.
The term is weighted at 35% of the total academic year which translates to the following breakdown of marks across the term and year.

Project 1 is weighted at 28% of the term 3 CA (20 marks)

Project 2 (EOT project) is weighed at 42% of the term 3 CA (30 marks)

The end of term examination is weighted at 30% of term 3 (100 marks)

The materials to be covered in Project 1 will be assessed on outcome and the amount of detail that students apply to their responses in the work they produce. Each group of tasks in the student book is listed under each grade section of this document and form the project. To achieve the best results, students must complete each task and document their work in full by describing and completing each project task as listed in the marking tables provided with the student project worksheets.

Students must produce the work independently to be fairly and accurately assessed. Written and non-practical work should be completed by the individual students in their student course book however, please have your students complete the Project 1 student worksheets for **final** submission of content for continuous assessment. Teachers must assess practical work as it is done by the students using the marking guidance provided in this document.

The maximum possible marks for the project are 20. The mark awarded will be entered in the student grade book (SIS) for term 3 under the CA column named Project 1.

10 & 11 GENERAL – TERM 3 2016 / 2017

PROJECT 1 (Pages 88 - 93 in student book)

Project 1.1: The Hardware

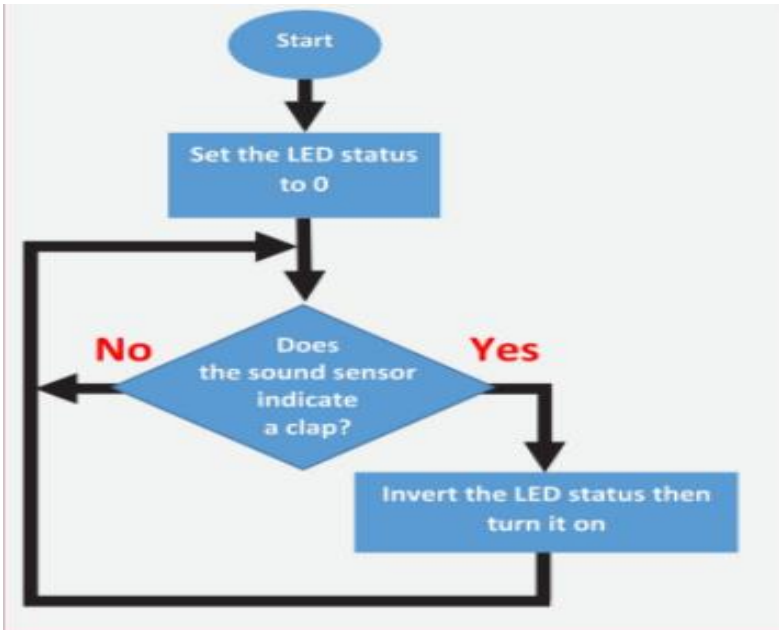
In this project, you will create a smart desk lamp that simulates the real-life working process of the desk lamp. You will use the I/O Modules Kit to create this system. Then you will choose the needed modules for this project and describe their roles in the project.

Task – Describe the input required and the output of the whole process.		
INPUT (SOUND SENSOR)	CONTROLLER (MICROCONTROLLER)	OUTPUT (LED LIGHT)
When you clap near to the desk lamp the sound sensor receives this sound, and sends a signal to the controller to be processed.	The microcontroller is the control unit. Think of it as the brain of your device.	*LED light*

Project 1.1 - Page 90 in teacher guide – (2 marks).
2 marks - can be awarded for correctly stating the input and outputs – as shown.
(1 mark for each correct response)

Project 1.2: Flowchart - Page 91 in teacher guide - (5 marks).

Task - Write your code to match the flow of the control process.



- **1 mark** can be awarded for initializing LED to 0.
- **1 mark** can be awarded for the decision statement (diamond shape).
- **1 mark** can be awarded for the “YES” branch of decision statement.
- **1 mark** can be awarded for the “No” branch of decision statement.
- **1 mark** can be awarded for the flowchart shapes followed for different statements.

Project 1.3: The Code - Pages 92 & 93 in teacher guide - (6 marks).

Based on the last flowchart you created, you will write the code through different steps.

Tasks - Write the code in the boxes.

a.

```
//initialise the variable:

int LEDstate=0; // the LED status variable to be 0
```

Set the `void setup()` code according to the needed inputs and outputs.

b.

```
void setup() {
  // put your setup code here, to run once:
  // initialise serial communication at 9600 bits per second
  Serial.begin(9600);
  pinMode(13,OUTPUT); // set pin 13 as a digital output (the LED light)
}
```

For the actual code, you need to set the `void loop()`, start with the input of the system.

c.

```
void loop() {
  // put your setup code here, to run once:

  // read the input on analog pin 0 (the sound sensor)

  int soundSensor = analogRead(0);
}
```

Add the conditional part of the system.

d.

```
void loop() {
   Serial.println(soundSensor);
   // updating the LED status process:
   if(soundSensor>30)
   {
      LEDstate =!LEDstate;
      digitalWrite(13,LEDstate);
      delay(200);
   }
}
```

Project 1. 3 – Answer key and marking guidance.

- Part a - **1 mark** can be awarded for initializing statement.
- Part b - **1 mark** can be awarded for the setup() function.
- Part c - **1 mark** can be awarded for the loop() function with Serial begin statement and **1 mark** awarded for the pinMode() function which is the input statement to the system. **(2 marks)**
- Part d - **1 mark** can be awarded for the "if statement" with condition and **1 mark** can be awarded for the true part statements of the "if-statement". **(2 marks)**

Exercise 3.1: Sound Sensor and Boolean Operator – Page 93 & 94 in teacher guide - (5 marks).

Use the sound sensor with an LED module to create a smart desk lamp system with the
following features:

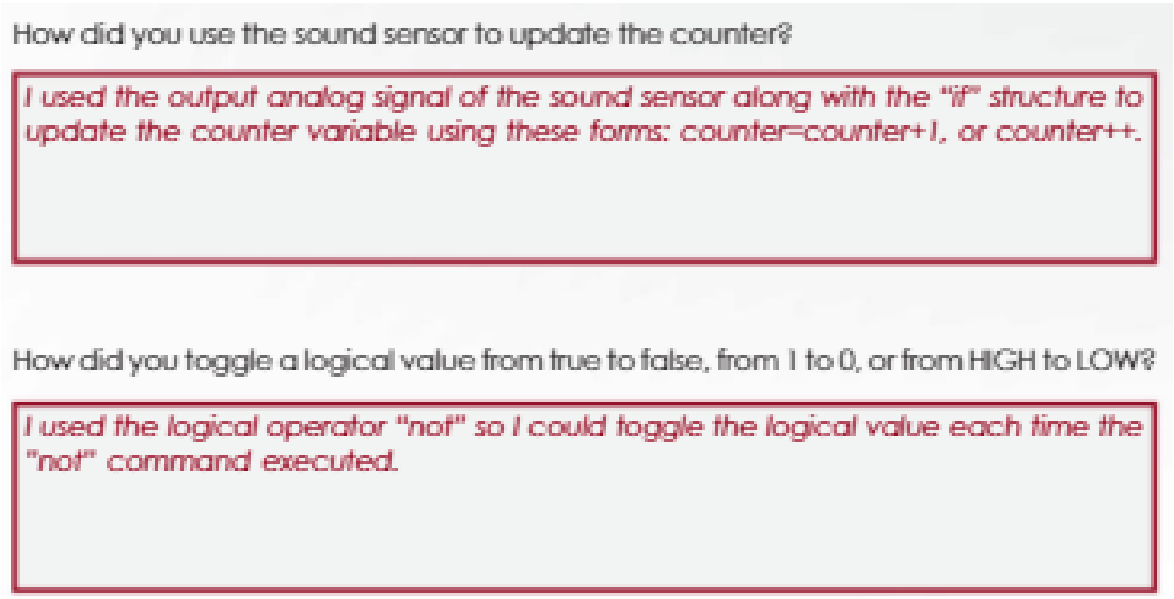
- The LED turns ON after two claps (or at a certain number of claps).

```
//initialise the variable:
int LEDstate=0;    // the LED status variable to be 0
int counter=0;  // the counter variable to be 0

void setup() {
   // put your setup code here, to run once:

   // initialise serial communication at 9600 bits per second
   Serial.begin(9600);
   pinMode(13,OUTPUT); // set pin 13 as a digital output ( the LED light)
}

void loop() {
   // put your main code here, to run repeatedly:

    // if the LED status is HIGH and the sound sensor got activated then
   // turn off the LED:
   if(LEDstate==HIGH && analogRead(0)>30)
   {
      LEDstate=!LEDstate; //invert the LED status
      //control the LED light according to the LED status variable
      digitalWrite(13,LEDstate);
      delay(100);
   }

   // update the counter when the sound sensor got activated:
   if(analogRead(0)>30)
   {
      counter++;
      delay(200);
   }

   Serial.println(counter);

   // updating the LED status process
   if(counter==2) // if there are two claps then update the LED
   {
      LEDstate=!LEDstate;
      digitalWrite(13,LEDstate);
      counter=0; // reset the counter
      delay(100);
   }
}
```

Exercise 3.1 – Answer key and marking guidance.

- **1 mark** can be awarded for the initializing statements.
- **2 marks** can be awarded for the "if statement" with the Boolean expression to activate the sound sensor and using for counter updating.
- **2 marks** can be awarded for updating the LED status process according to the claps input.

Student Reflection - (2 marks)
Page 95 in teacher guide –



Student Refection – Answer key and marking guidance.

- **1 mark** can be awarded if the student mention how the counter variable is used.
- **1 mark** can be awarded if the student mention the use of Boolean operator "NOT".
- **2 marks (total for student reflection)**

MAXIMUM TOTAL MARKS = 20

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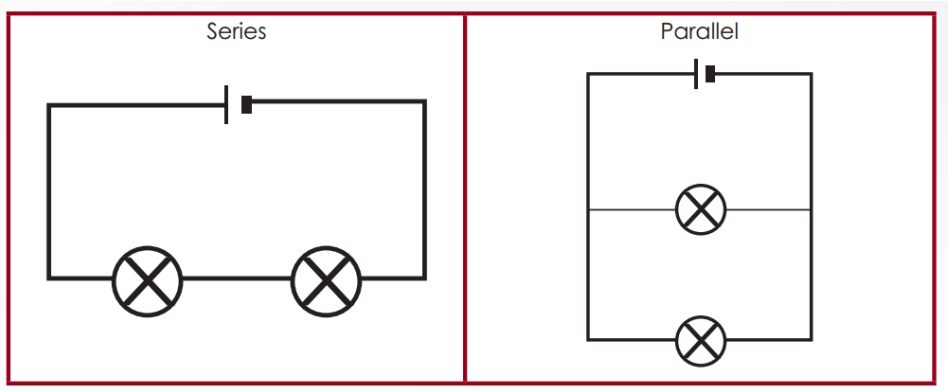
PROJECT 1 (Pages 35, 44, 47, 84 & 85 – student book)

Lesson 1 - Activity 5 – Page 34 in teacher guide. (4 marks)

In this task, the students will draw the schematic diagram for the electrical circuit with two lamps in both series and parallel forms in the box given below.



Series – **(1 mark)**

1 mark for correct circuit layout schematic & correct component symbols**.**

Parallel – **(1 mark)**

1 mark for correct circuit layout schematic & correct component symbols.

Please note – 0 marks for incorrect symbols or schematic layout.

Lesson 1 - Activity 11 – Practical

Using multimeter students will demonstrate to check which pins on their breadboard are connected to each other using two wires from the kit. Students will demonstrate the practical to the teacher

Lesson 1 - Activity 12 – Calculations (2 marks) - calculator permitted.

Pages 47 – 49 in teacher guide.

Students will find the total resistance of the parallel circuit using the diagram shown and then calculate the equivalent resistance total in a series circuit.

Students need to show the equations they used to make the calculations and then give the correct answers to both parts of this section. Schematic diagrams are not necessary to get full marks for this section. See next page.

Step 1: Start by finding the total resistance of the parallel branch (R2 and R3).

$$\frac{1}{R\ parallel} = \frac{1}{R2} + \frac{1}{R3}$$

$$= \frac{1}{4.7k\Omega} + \frac{1}{10k\Omega}$$

$$= \frac{1}{4700\Omega} + \frac{1}{10000\Omega}$$

$$= \frac{10000\Omega + 4700\Omega}{10000\Omega \times 4700\Omega}$$

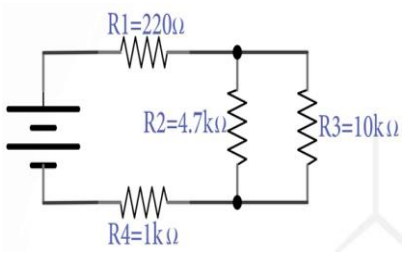
$$= \frac{14700\Omega}{47000000\Omega}$$

But you need R parallel and not $\frac{1}{R\ parallel}$, then:

$$R\ parallel = \frac{47000000\Omega}{14700\Omega}$$

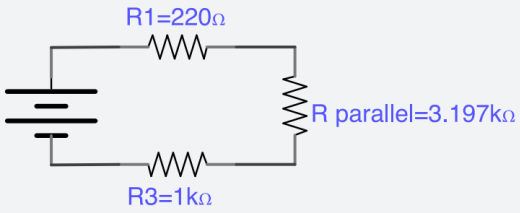
$$= 3197.2\Omega$$

$$= 3.197k\Omega$$



Parallel circuit.

The circuit now is simplified to three resistors in series.



Step 2: Find the total resistance for the three resistors in series.

R equivalent = R1 + R Parallel + R4

= 220Ω + 3.197 kΩ + 1 kΩ

= 220Ω + 3197Ω + 1000Ω

= 4417Ω

≈ 4.4 kΩ

Hence, the following two circuits are equivalent.

Series circuit.

Parallel calculations –
1 mark for use of an equation / **1 mark** for the correct calculation. **(2 marks)**
Series calculations –
1 mark for use of an equation / **1 mark** for the correct calculation. **(2 marks)**

Lesson 3 – Activity 6 Coding - Pages 82/83 in teacher guide (14 marks)

Students will write the coding statements related to serial communications for the following questions in the given spaces. Upon completing all the questions the students will upload the coding and check the result.
Errors in code writing will result in **0 marks** being awarded.

1. Define an integer variable and name it **count** and give it a value zero. **(1 mark)**

```
int count = 0;
```

2. Print out an explanation message. **(1 mark)**

```
Serial.println("Counting integer numbers starting from 0");
```

3. Display the current count. **(2 marks)**

```
Serial.print("Count = ");
Serial.println(count);
```

4. A procedure to increase the counts. **(3 marks)**

```
count = count +1;
```

5. 100 millisecond delay time. **(1 mark)**

```
delay(100);
```

6. Which one of those steps needs to be done once only? **(2 marks)**

The counter initialisation and the explanation message.

7. Which one of those steps need to run continuously in a loop? **(2 marks)**

Updating the counter and displaying its value.

Student reflection – **(2 marks)**

Research the Baud Rate and write down why it is important to send and receive data.

1 mark for mentioning the signal speed.

1 mark for mentioning components involved.

Answers may vary. The answers below are example suggestions only.

- The higher the baud rate the faster the binary signals process on the motherboard.
- The Baud rate is important it controls the speed of transfer between the Arduino microcontroller and the computers processing chip.
- A lower Baud rate will slow down the speed of which information is presented to the chip.

MAXIMUM TOTAL MARKS = 20

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PROJECT 1 CONTENT - (Lesson 5)

Activity 7 – Coding (Pages 119 & 120 in student book)

Write your code:

a. **Write** a statement to **define an integer number** to store the tone and name it toneVal. **(1 mark)**

```
int toneVal;
```

b. (i) **Write** a statement to **define pin 8** as an output. **(1 mark)**

```
pinMode(8, OUTPUT);
```

b. (ii) Since the human ears can hear frequencies from 20 Hz to 20 KHz, you must change the value of the toneVal between these two limits. **The for-loop** that changes the toneVal starting from 1000 to 5000 with an increment of 5 is written as follows: **(1 mark)**

```
for (int toneVal = 1000; toneVal <= 5000; toneVal = toneVal + 5)
{
}
```

c. (i) **Adjust** the *for-loop* to generate the tone signal at pin 8 for the frequency of toneVal and
add a delay of 2 millisecond after the tone() command. **(3 marks)**

```
for (int toneVal = 1000; toneVal <= 5000; toneVal = toneVal + 5)
{
tone(8, toneVal);
delay(2);
}
```

NOTE:

1 mark for tone command
1 mark for delay command
1 mark for the proper sequence of tone and delay command

(Maximum 3 marks)

c. (ii) **Write** the second method that also uses the duration option in the tone command. **(1 mark)**

```
tone(8, toneVal, 2);
```

End of Unit Assessment (Pages 121 – 123)

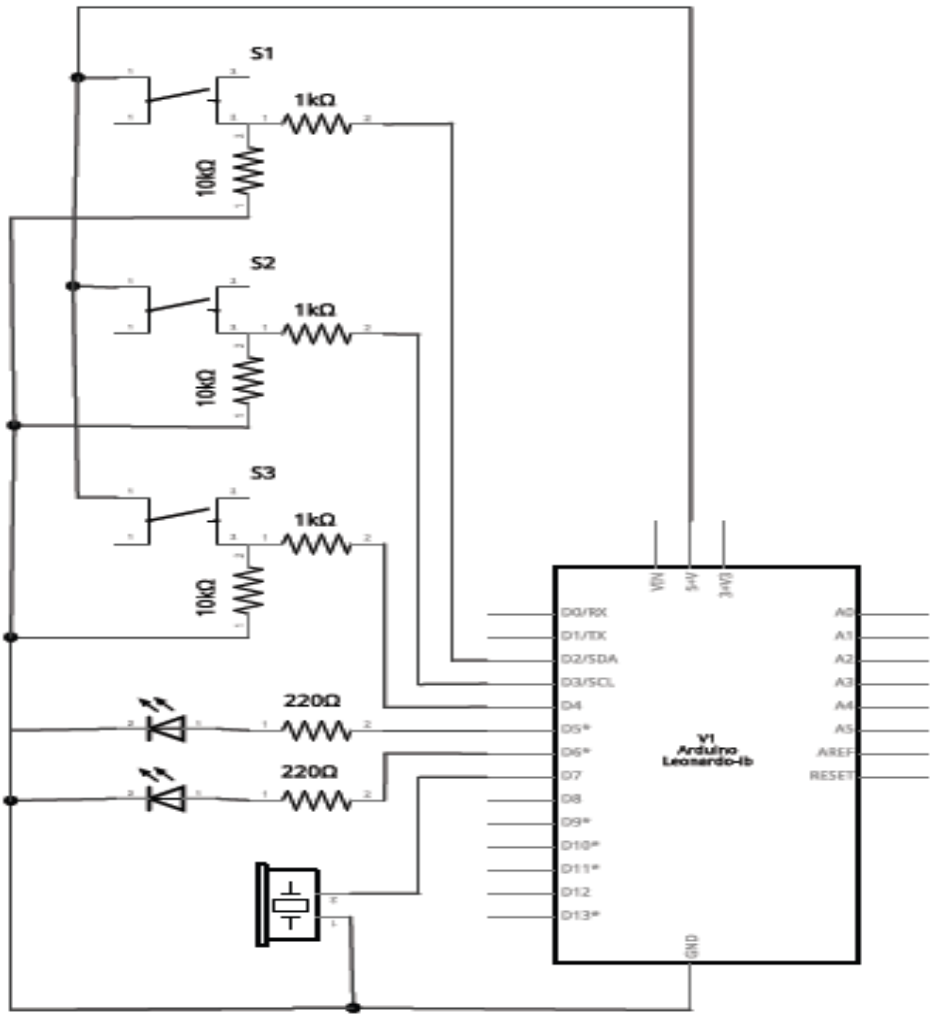
1. **Write** a code that uses three push buttons to control two LEDs and one buzzer.

```
void setup()
{
pinMode(2,INPUT);
pinMode(3,INPUT);
pinMode(4,INPUT);
pinMode(5,OUTPUT);
pinMode(6,OUTPUT);
pinMode(7,OUTPUT);
void loop()
{
if(digitalRead(2)==HIGH)
digitalWrite(5,HIGH);
if(digitalRead(3)==HIGH)
digitalWrite(6,HIGH);
if(digitalRead(4)==HIGH)
digitalWrite(7,HIGH);
digitalWrite(5,LOW);
digitalWrite(6,LOW);
digitalWrite(7,LOW);
}
```

NOTE:
1 mark for defining pinmode as input
1 mark for defining pinmode as output
1 mark for setup() and loop() function
1 mark for if condition
1 mark for digitalwrite command statements

(5 marks maximum)

2. **Draw** the schematic circuit for the above code.



NOTE:

1 mark for push buttons symbol
1 mark for LED symbol
1 mark for buzzer symbol
1 mark for resistor symbol
2 mark for correct pin connection to the Arduino board

(6 marks maximum)

3. **List** an alternative use for LED lights. (1 mark maximum)

USE 1	LED light strip
USE 2	Solar powered lighting
USE 3	LED signs & displays
USE 4	Household lighting – internal & external
USE 5	Emergency lighting
USE 6	Decorative lighting - festivals, birthdays,
USE 7	Portable light sources – torches & lanterns
USE 8	Light sources in transport – cars, boats, planes
USE 9	Low voltage lighting in mines/quarries
USE 10	Novelty goods – greetings cards, toys etc.

NOTE: 1 mark for any relevant answer like the above options. Student answers may vary – teachers should use their professional judgement.

4. **List** an alternative use for buzzers.

USE 1	Wearable devices – watches & fitness devices,
USE 2	Sensors – pressure, sonar equipment, vibration & engine sensors.
USE 3	Electric guitar pickups
USE 4	Alarm devices
USE 5	Confirmation of user input (ex: mouse click or keystroke)
USE 6	Ultrasonic cleaning
USE 7	Sporting event & game show buzzers
USE 8	Relays & switches
USE 9	Timers & clocks
USE 10	Household appliances Electronic metronomes
USE 11	Ultrasonic scanners & medical procedures
USE 12	Compact speakers
USE 13	Novelty goods – greetings cards, toys etc.
USE 14	Mobile phones & compact electronic gadgets

NOTE: 1 mark for any relevant answer like the above options. Student answers may vary – teachers should use their professional judgement.

MAXIMUM TOTAL MARKS = 20