SEC37/c3.19m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2019 MAIN SESSION

SUBJECT:	**Engineering Technology**
PAPER NUMBER:	Controlled – Unit 3
DATE:	9th April 2019
TIME:	10:00 a.m. to 11:35 a.m.

THIS PAPER SHOULD BE RETURNED TO THE INVIGILATOR AFTER THE EXAMINATION.

Name of candidate _____

I.D. number _____

School _____

Class _____

Answer **ALL** questions in the space provided. The use of non-programmable electronic calculators is allowed.

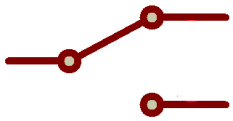
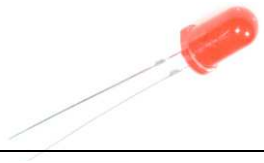
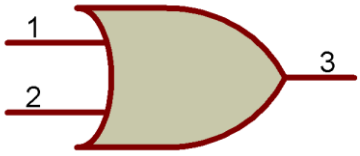
Scenario

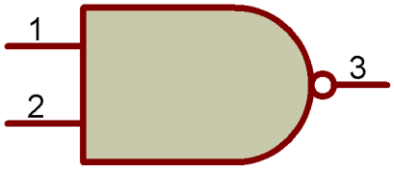
You are applying to work as a technician with a company that repairs electronic equipment. Answer **ALL** the questions to demonstrate that you are competent in the field of electronics.

Question 1 **K1 (4 marks)**

In Table 1, identify the component corresponding to the schematic or real life representation provided from (a) to (h) in the first column.

Table 1 – Schematic and real-life representations of electronic components.

	Schematic and real-life representations	Component name
(a)		
(b)		
(c)		
(d)		
(e)		
(f)		
(g)		

	Schematic and real-life representations	Component name
(h)		

Question 2 **K4 (4 marks)**

During testing procedures, technicians encounter various circuits that contain different resistor setups. As part of their job they are required to measure voltages, currents and determine values of resistors.

(a) Circuit 1.

Figure 1 shows three resistors in series supplied from a 24 V battery. R1 is 20 Ω and R2 is 40 Ω. The total circuit current is 300mA

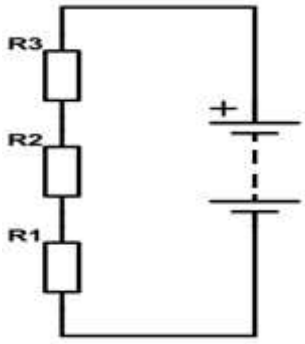


Figure 1 – Circuit 1

Calculate the value of resistor 3 (R3), showing all workings.

(2)

This question continues on next page.

(b) Circuit 2.

The circuit shown in Figure 2 is built on a prototyping board. The resistors R1 and R2 each have a value of 10Ω. The total power dissipated by the circuit is 28.8 Watts.

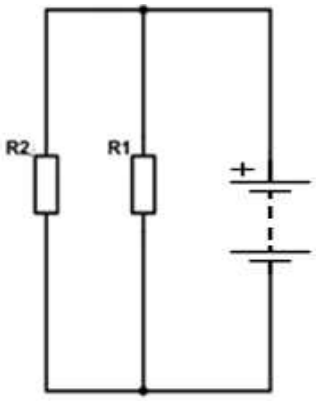


Figure 2 – Circuit 2

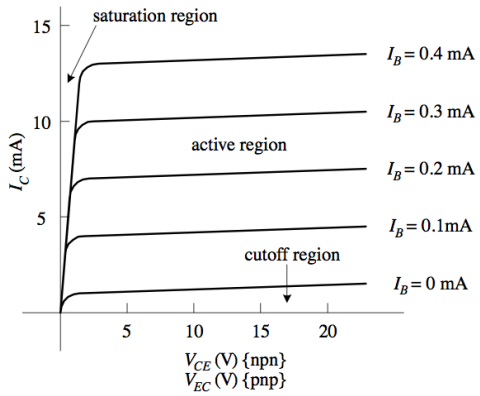
Calculate the voltage of the cell required to power the circuit, showing all workings.

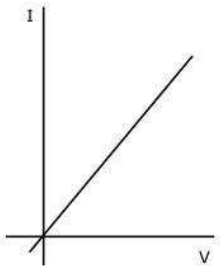
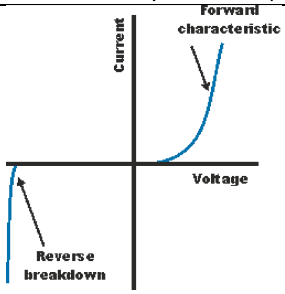
(2)

Question 3 **C2 (6 marks)**

Electronic components have different Current/Voltage characteristics. This property makes them useful for different applications.
Refer to the characteristic curves shown in Table 2 and answer the questions below.

Table 2 – Characteristic curves of various electronic components.

	Characteristic Curves (Current I/Voltage V)
Curve 1	 *(Source https://upload.wikimedia.org)*

	Characteristic Curves (Current I/Voltage V)
Curve 2	 *(Source https://iwantarobotpet.files.wordpress.com)*
Curve 3	 *(Source http://www.radio-electronics.com)*

(a) Which graph represents the Current/Voltage (IV) characteristics of a diode?

_____

(½)

(b) Which graph represents the Current/Voltage (IV) characteristics of a transistor?

_____

(½)

(c) Which graph represents the Current/Voltage (IV) characteristics of a resistor?

_____

(½)

(d) Refer to the characteristic curve 3 and answer the questions below.

(i) Describe what happens in the reverse region.

_____

_____

_____

_____

_____

(1)

This question continues on next page.

(ii) Describe what happens in the forward region.

(1)

(e) Refer to the characteristic curve 1 and state the meaning of the following terms:

(i) V_{CE}

(½)

(ii) Active Region

(1)

(iii) Cut-off Region

(1)

Question 4 **K5 (4 marks)**

During the construction of electronic circuits, various tools and equipment will be used. In Table 3, below, fill in the name of the tool corresponding to the picture provided.

Table 3 – Tools used to manufacture electronic circuits.

	Tool picture	**Tool name**
(a)	 *(Source: https://www.circuitspecialists.com)*	
(b)	 *(Source: https://images-na.ssl-images-amazon.com)*	
(c)	 *(Source: https://www.circuitspecialists.com)*	
(d)	 *(Source: https://www.circuitspecialists.com)*	
(e)	 *(Source: https://www.circuitspecialists.com)*	
(f)	 *(Source: https://www.circuitspecialists.com)*	

This question continues on next page.

	Tool picture	Tool name
(g)	 *(Source: https://www.circuitspecialists.com)*	
(h)	 *(Source: https://www.circuitspecialists.com)*	

Question 5 **C4 (6 marks)**

You are required to measure various voltages and currents to perform troubleshooting on a car audio amplifier circuit.

(a) State which equipment is required to measure the AC output voltage of the amplifier, justifying its use in this scenario based on **TWO** properties.

(1)

(b) State **TWO** properties which can be analysed and measured by this equipment.

(2)

(c) What equipment is required to measure the DC supply current of the amplifier.

(1)

(d) List another **TWO** properties which can be analysed and measured by this equipment.

(2)

Question 6 **K7 (4 marks)**

The circuit shown in Figure 3 was set up where two LEDs shown as D1 and D2 were connected in series with two current limiting resistors R1 and R2 respectively. A fuse FU1 was included to protect the circuit in case of a short circuit. To check that all is working well various tasks need to be undertaken.

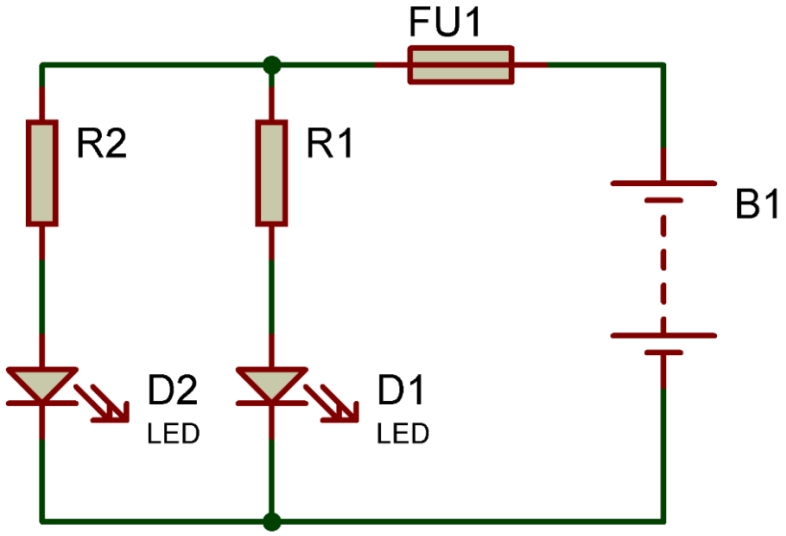


Figure 3 – Circuit 3.

(a) The first task would be to measure the voltages.

(i) Describe how to measure the voltage across D2.

(1)

This question continues on next page.

(ii) Sketch the setup used to measure the voltage across D2 in the space below to support your answer.

(1)

(b) The second task would be to measure the current flowing through Resistor 2.

(i) Describe how to measure the current flowing through R2.

(1)

(ii) Sketch the setup used to measure the current flowing through resistor 2 in the space below to support your answer.

(1)

Question 7 **C5 (6 marks)**

Electronic circuit boards are mainly used to electronically connect all the circuit components together. There are various electronic boards in use.

(a) Identify **TWO** advantages and **ONE** disadvantage of a breadboard.

(3)

(b) Identify **TWO** advantages and **ONE** disadvantage of a Printed Circuit Board (PCB).

(3)

Please turn the page.

Question 8 **K10 (4 marks)**

Soldering is used to ensure that the components are electrically sound to the circuit board, while enabling the separate components to work as a complete circuit.

(a) Describe the process of soldering a resistor on a Printed Circuit Board (PCB).

(2)

(b) Describe a soldering process for mass produced circuits.

(2)