



L-Università  
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE  
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL  
2023 SUPPLEMENTARY SESSION**

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SUBJECT: **Engineering Technology**  
PAPER NUMBER: Synoptic – Unit 2  
DATE: 2<sup>nd</sup> November 2023  
TIME: 5:30 p.m. to 7:35 p.m.

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

**For examiners' use only:**

<b>Question</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>Total</b>
<b>Score</b>									
<b>Maximum</b>	<b>6</b>	<b>12</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>12</b>	<b>8</b>	<b>70</b>

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

**Scenario**

- An electronics company wanted to assess prospective electronics technicians.
- The applicants were given the following test to assess their knowledge in electronics.

**Question 1**

**K-1 (6 marks)**

a. Categorise the following materials as insulators or conductors by filling in Table 1 below.

Aluminium	Paper	Plastic	Mercury
Glass	Ceramic	Gold	Iron

Table 1: Conductors or Insulators.

Conductors	Insulators

(2)

b. Define the term semi-conductor.

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(2)

- c. • The resistance of two wires of the same length was measured by using a multi-meter.  
 • Although the length was the same for both wires, the resistance was different.  
 State the **TWO** parameters that account for the difference in resistance of the **TWO** wires.

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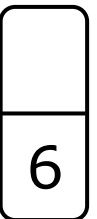


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(2)



**Question 2**

**C-1 (12 marks)**

- a. Describe the relationship between resistance, voltage and current.  
Write down the equation and the SI unit for each parameter.

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(4)

- b. Figure 1 shows the current and voltage measurements of a resistor under test.  
Determine the resistance of the resistor under test. Show all your workings.

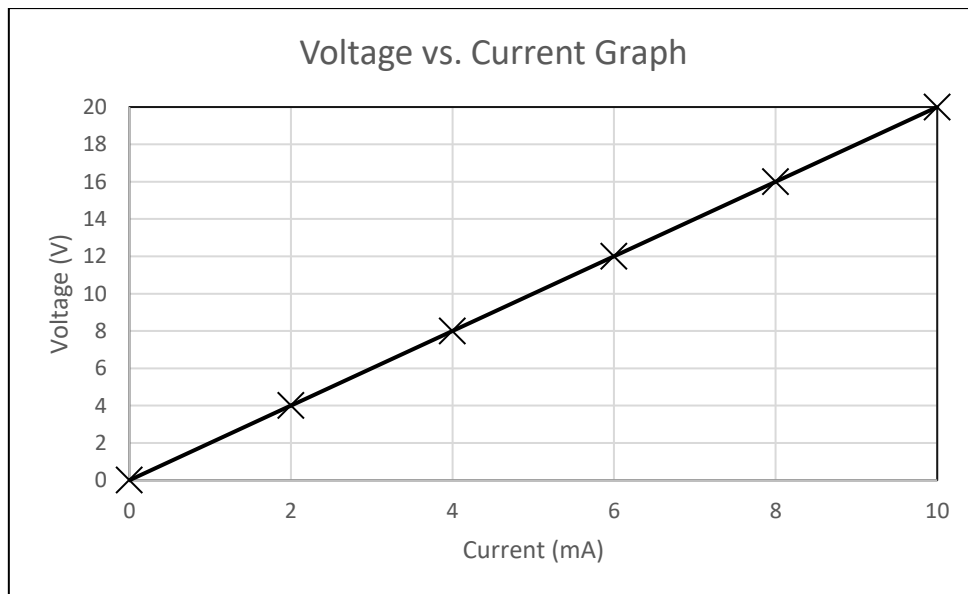


Figure 1: Voltage vs Current graph of a resistor

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(4)

c. Calculate the value of resistance R1 in the circuit shown in Figure 2 given that the LED requires 2.5 V and 25 mA to operate. Show all your workings.

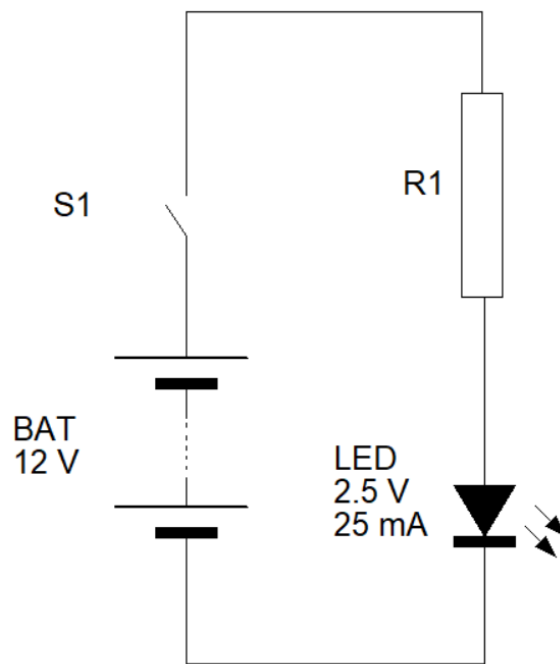


Figure 2: Circuit

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(4)





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**Question 3**

**K-4 (8 marks)**

a. Identify the different designs of switches given in Table 2 below.

Table 2: Different designs of switches.

	<b>Switch</b>	<b>Name of Switch</b>
i.	 (Source: <a href="https://za.rs-online.com/">https://za.rs-online.com/</a> )	_____ (0.5)
ii.	 (Source: <a href="https://mt.rsdelivers.com/">https://mt.rsdelivers.com/</a> )	_____ (0.5)
iii.	 (Source: <a href="https://www.eeshopbd.com/">https://www.eeshopbd.com/</a> )	_____ (0.5)
iv.	 (Source: <a href="https://www.fabian.com.mt/">https://www.fabian.com.mt/</a> )	_____ (0.5)

***This question continues on next page.***

b. Identify the different types of switches shown in Table 3 from their schematics in terms of poles and throws.

Table 3: Different type of switches.

	Schematic symbol	Type of Switch
i.		_____ (0.5)
ii.		_____ (0.5)
iii.		_____ (0.5)
iv.		_____ (0.5)

(Source: <https://www.allaboutcircuits.com>, <https://www.dummies.com>)

c. Select the appropriate switch for the following **TWO** scenarios.

i. Select a switch to control the rotational direction of a motor. The motor will rotate in an anticlockwise direction in one switch position and rotate in a clockwise direction when the switch position is changed.

\_\_\_\_\_ (2)

ii. Select a switch to power off a lathe when an emergency occurs.

\_\_\_\_\_ (2)


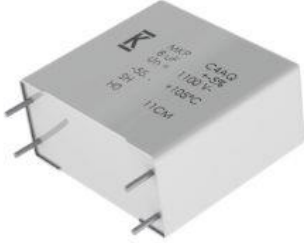


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**Question 4**

**K-5 (8 marks)**

a. Identify the different types of capacitors provided in Table 4.

Table 4: Different types of capacitors.

	Picture of Capacitor	Type of capacitor
i.	 <p>(Source: <a href="https://www.jeccapacitor.com/">https://www.jeccapacitor.com/</a>)</p>	<p>_____</p> <p>_____</p> <p>(0.5)</p>
ii.	 <p>(Source: <a href="https://www.powerelectronicstips.com/">https://www.powerelectronicstips.com/</a>)</p>	<p>_____</p> <p>_____</p> <p>(0.5)</p>
iii.	 <p>(Source: <a href="https://www.jeccapacitor.com/">https://www.jeccapacitor.com/</a>)</p>	<p>_____</p> <p>_____</p> <p>(0.5)</p>
iv.	 <p>(Source: <a href="https://components101.com/">https://components101.com/</a>)</p>	<p>_____</p> <p>_____</p> <p>(0.5)</p>

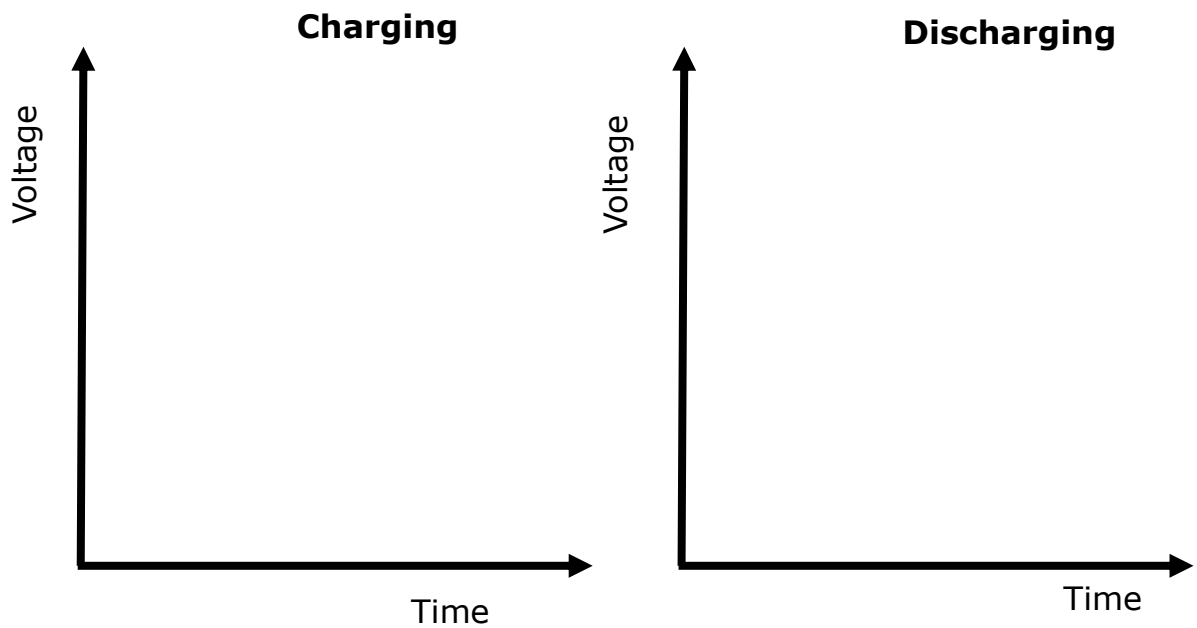
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b. Rank the given values of capacitors in ascending order that is starting from the smallest to the largest capacitance value.

$0.022 \mu F, 5.1 pF, 1.5 nF, 6.8 \mu F, 0.00015 mF$

- i. \_\_\_\_\_ (0.4)
- ii. \_\_\_\_\_ (0.4)
- iii. \_\_\_\_\_ (0.4)
- iv. \_\_\_\_\_ (0.4)
- v. \_\_\_\_\_ (0.4)

c. On the graphs provided, sketch the voltage vs. time graphs of a charging and discharging capacitor.



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**Question 5**

**K-6 (8 marks)**

a. Identify the different types of signals illustrated in Table 5.

Table 5 – Different types of Signals

	Signal	Name
i.		
ii.		
iii.		
iv.		

(Source: <https://www.shutterstock.com>)

(2)

b. Define **TWO** parameters of a square wave signal and state their respective SI unit.

Parameter 1: \_\_\_\_\_ (0.5)

SI unit of Parameter 1: \_\_\_\_\_ (0.5)

Parameter 2: \_\_\_\_\_ (0.5)

SI unit of Parameter 2: \_\_\_\_\_ (0.5)

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c. Label important features of the oscilloscope given in Figure 3.

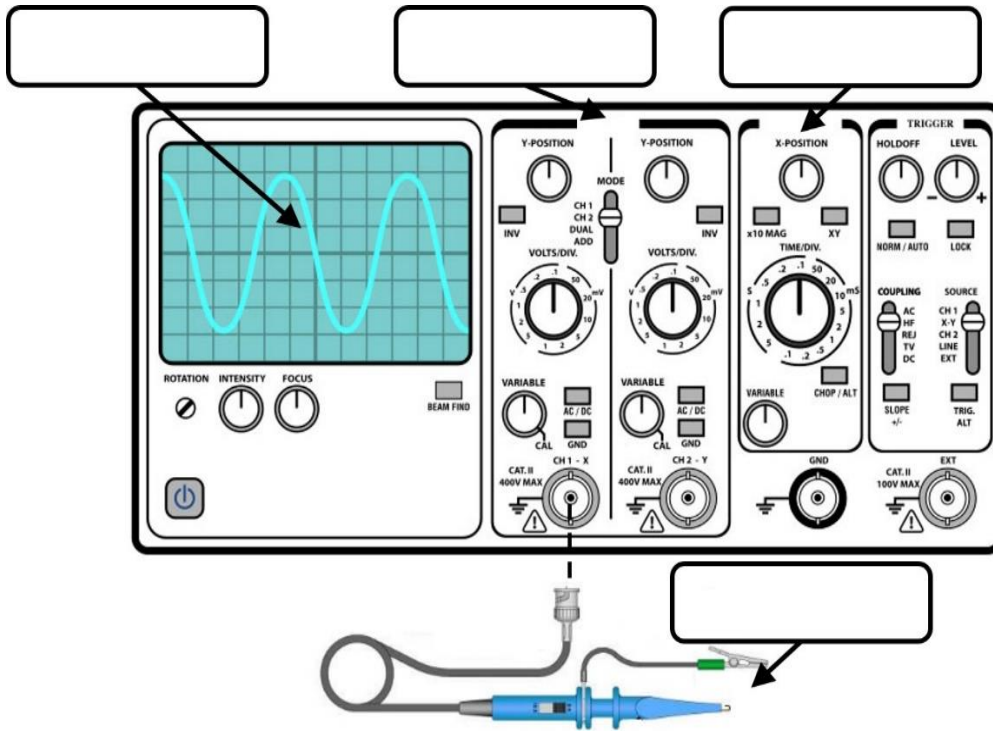


Figure 3 – Oscilloscope  
(Sources: <https://www.wellpcb.com/> and <https://www.shutterstock.com>)

(4) 8

**Question 6**

**K-7 (8 marks)**

a. List **TWO** different types of analogue devices

Analogue device 1: \_\_\_\_\_ (1)

Analogue device 2: \_\_\_\_\_ (1)

b. List **TWO** characteristics for **each** analogue device listed in Question 6a.

Analogue device 1

Characteristic 1: \_\_\_\_\_ (0.5)

Characteristic 2: \_\_\_\_\_ (0.5)

Analogue device 2

Characteristic 1: \_\_\_\_\_ (0.5)

Characteristic 2: \_\_\_\_\_ (0.5)

c. Describe the function of the analogue devices listed in Question 6a.

Function of the Analogue device 1: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2)

Function of the Analogue device 2: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2)

8

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**Question 7**

**C-4 (12 marks)**

- a. List **FOUR** different types of logic gates and their respective symbols. Write your answers in column (a) in Table 6. (4)
- b. Write the truth tables of the **FOUR** logic gates listed in Question 7(a). Write your answer in column (b) in Table 6. (4)

Table 6: Logic Gates.

	<b>(a) Name of Logic Gate and Symbol</b>	<b>(b) Truth Table</b>		
i.	Logic Gate: _____  Symbol:	Input 1	Input 2	Output
		0	0	
		0	1	
		1	0	
		1	1	
ii.	Logic Gate: _____  Symbol:	Input 1	Input 2	Output
		0	0	
		0	1	
		1	0	
		1	1	
iii.	Logic Gate: _____  Symbol:	Input 1	Input 2	Output
		0	0	
		0	1	
		1	0	
		1	1	
iv.	Logic Gate: _____  Symbol:	Input 1	Input 2	Output
		0	0	
		0	1	
		1	0	
		1	1	

c. Determine the output of the multi-stage circuit shown in Figure 4. Show all your working in the truth table given below.

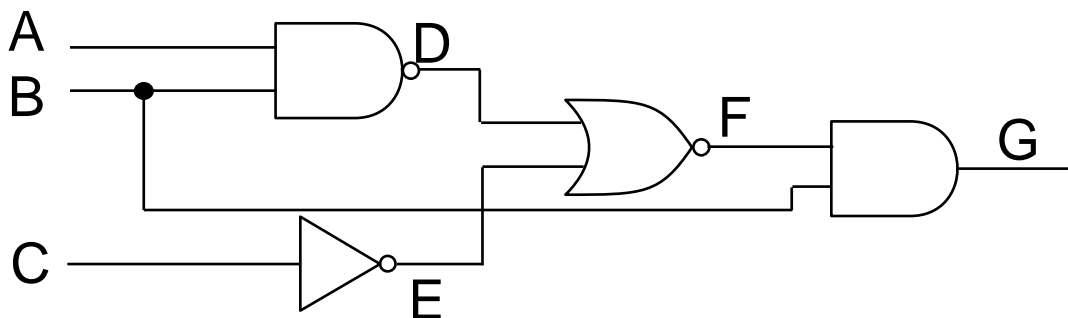


Figure 4: Circuit 3

Table 7: Truth table

A	B	C	D	E	F	G
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

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(4)

**Question 8**



**K-9 (8 marks)**

a. Identify the electronic symbols illustrated in Table 8 below.

Table 8 – Electronic Symbols.

	Electronic Symbol	Name
i.		_____ (0.5)
ii.		_____ (0.5)

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iii.		_____ (0.5)
iv.		_____ (0.5)

(Source: <https://www.shutterstock.com>)

b. Match the following SI units to their respective parameters by connecting a line between them.

Volts

Power

Watts

Resistance

Farads

Capacitance

Amps

Voltage

Ohms

Current






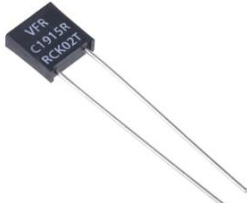
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c. Table 9 below shows different packaging of electronic components. Identify **each** of the given package, using the following terms:

single-in-line	dual-in-line	radial and through hole	axial and through hole
	axial	surface mount	through hole
			radial

Table 9 – Component Packaging.

	Packaging 1	Packaging 2
i.	 _____ (Source: <a href="https://www.quick-pcba.com/">https://www.quick-pcba.com/</a> )	 _____ (Source: <a href="https://electronics.stackexchange.com/">https://electronics.stackexchange.com/</a> )

<p>ii.</p>	 <p>_____</p> <p>(Source: <a href="https://quartzcomponents.com/">https://quartzcomponents.com/</a>)</p>	 <p>_____</p> <p>(Source: <a href="https://quartzcomponents.com/">https://quartzcomponents.com/</a>)</p>
<p>iii.</p>	 <p>_____</p> <p>(Source: <a href="https://ie.rs-online.com/">https://ie.rs-online.com/</a>)</p>	 <p>_____</p> <p>(Source: <a href="https://www.vishay.com/">https://www.vishay.com/</a>)</p>
<p>iv.</p>	 <p>_____</p> <p>(Source: <a href="https://www.instructables.com/">https://www.instructables.com/</a>)</p>	 <p>_____</p> <p>(Source: <a href="https://www.vishay.com/">https://www.vishay.com/</a>)</p>

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