Index Number:_____ SEC37/s2.25s

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2025 SUPPLEMENTARY SESSION

SUBJECT:	**Engineering Technology**
PAPER NUMBER:	Synoptic – Unit 2
DATE:	4th November 2025
TIME:	8:30 a.m. to 10:35 a.m.

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

For examiners' use only:

Question	1	2	3	4	5	6	7	8	Total
Score									
Maximum	6	8	8	8	8	8	12	12	70

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

Scenario

- An electronics company is seeking to recruit an electronics technician to assist in the repairs department.
- To assess the knowledge of applicants, the following test was designed.

Question 1 **K-1 (6 marks)**

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

Mercury	Porcelain	Gold	Wood
Glass	Brass	Aluminium	Ceramic

Table 1: Conductors or Insulators.

Conductors	**Insulators**

(2)

b. Define the term semi-conductor.

_____

_____

_____ (2)

c. Two pieces of wire of equal length have different resistance.
State **TWO** other parameters that affect the resistance of a piece of wire.

_____

_____

_____

_____ (2)

6

Question 2 **K-3 (8 marks)**

a. Differentiate between open and closed circuits.

_____

_____

_____

_____ (2)

b. In the space below, draw the following circuits:

i. A 3 V battery supplying a series combination of 1 x 560 Ω resistor and a 1 x 1 KΩ resistor.

(1)

ii. A 3 V battery suppling a parallel combination of a 330 Ω resistor in parallel with a 680 Ω resistor.

(1)

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c. Identify the series subcircuit and the parallel subcircuit in Figure 1 by referring to resistors R1, R2 and R3. Write your answers in the space provided below.

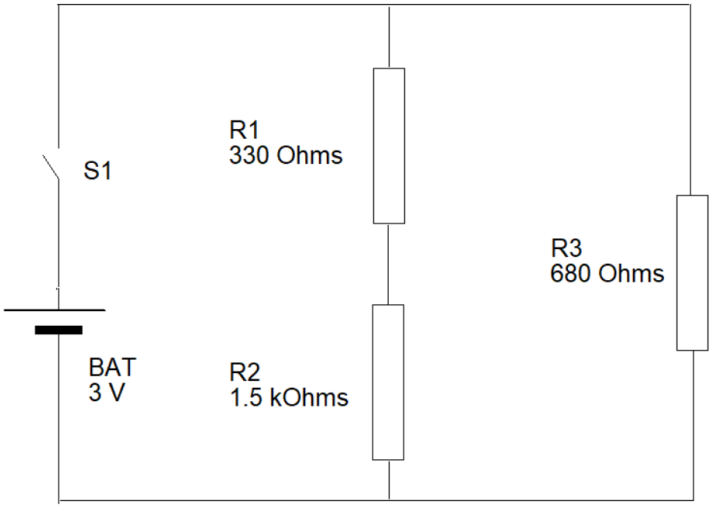


Figure 1: Series-parallel circuit

Series sub-circuit: _____ (2)

Parallel sub-circuit: _____ (2)

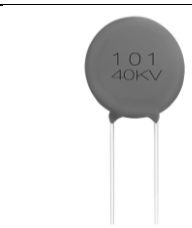
8

Question 3 **K-5 (8 marks)**

a. Identify the **FOUR** different types of capacitors provided in Table 2.

Table 2: Different types of capacitors.

	Picture of Capacitor	Type of capacitor
i.	 *(Source: https://alconelectronics.com/)*	_____ (0.5)
ii.	 *(Source: https://www.jeccapacitor.com/)*	_____ (0.5)

iii.	 *(Source: https://www.jeccapacitor.com/)*	_____ (0.5)
iv.	 *(Source: https://rajshreeelectronics.com/)*	_____ (0.5)

b. Rank the capacitor values listed below in ascending order starting from the smallest to the largest capacitator value.

$1.5\ \mu F, \quad 2200\ pF, \quad 0.15\ \eta F, \quad 0.033\ mF, \quad 8.2\ \eta F$

i. _____ (0.4)

ii. _____ (0.4)

iii. _____ (0.4)

iv. _____ (0.4)

v. _____ (0.4)

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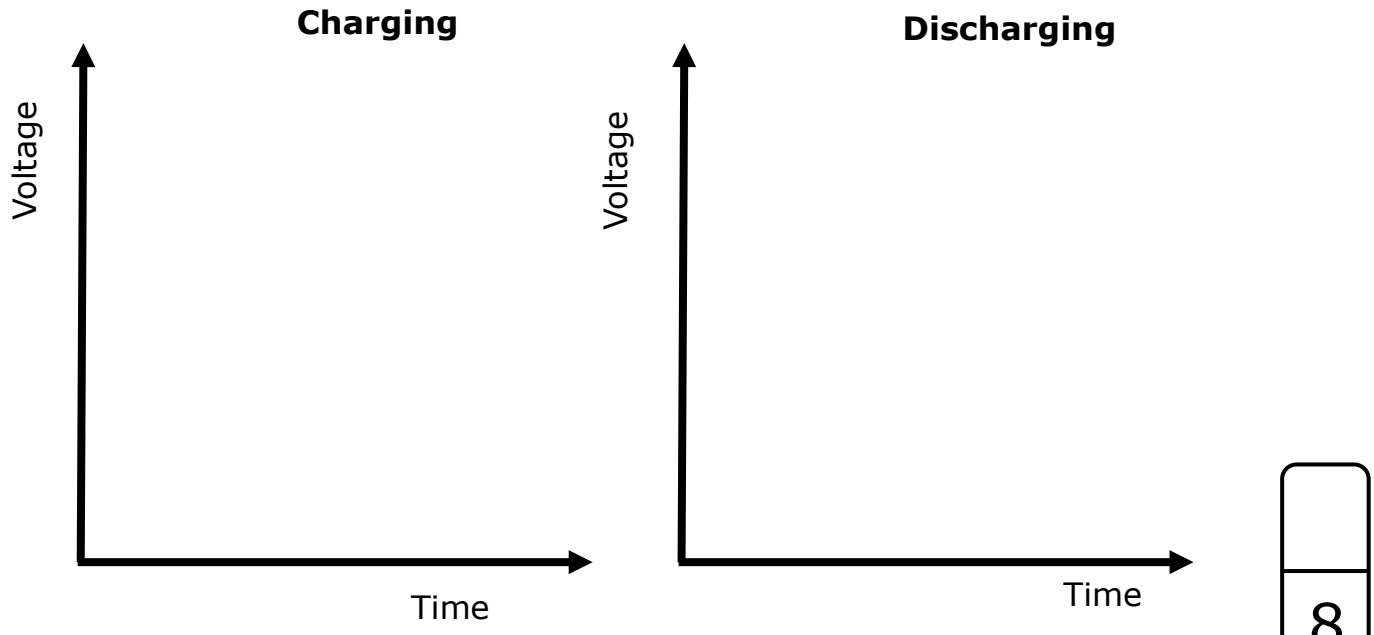
c. Sketch the voltage vs. time graphs of a charging and discharging capacitor on the graphs provided below.



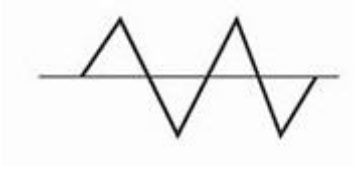
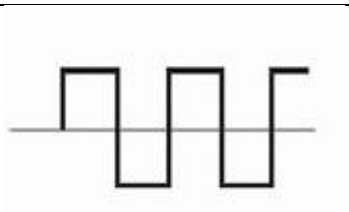
(4)

8

Question 4 **K-6 (8 marks)**

a. Identify the **TWO** different signals tabulated in Table 3.

Table 3: Different types of Signals

	Signal	Name
i.		_____ (1)
ii.		_____ (1)

(Source: https://www.circuitbasics.com/)

b. Define **TWO** parameters of a sine wave signal, and their respective units.

i. Parameter 1: _____(0.5)

SI Unit of Parameter 1: _____(0.5)

ii. Parameter 2: _____(0.5)

SI Unit of Parameter 2: _____(0.5)

c. Label the important features of the oscilloscope shown in Figure 2.

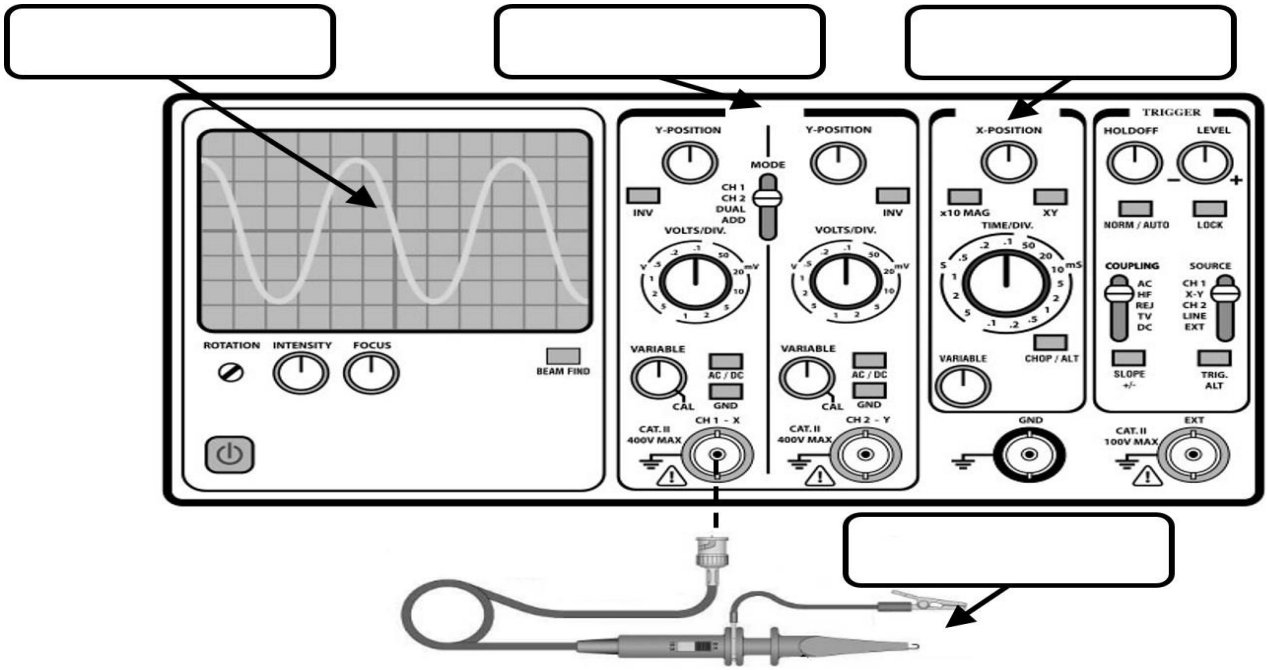


Figure 2: Oscilloscope
(Source: https://www.wellpcb.com/ and https://www.shutterstock.com)

(4)

8

Please turn the page.

Question 5 **K-7 (8 marks)**

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

i. Analogue device 1: _____(1)

ii. Analogue device 2: _____(1)

b. List **TWO** characteristics for each analogue device listed in Question 5a.

i. Analogue device 1

Characteristic 1: _____ (0.5)

Characteristic 2: _____ (0.5)

ii. Analogue device 2

Characteristic 1: _____ (0.5)

Characteristic 2: _____ (0.5)

c. Describe the function of the **TWO** analogue devices listed in Question 5a.

i. Function of the Analogue device 1: _____

_____

_____

_____

_____ (2)

ii. Function of the Analogue device 2: _____

_____

_____

_____

_____ (2)

8

Question 6 **K-10 (8 marks)**

a. Label the **FOUR** different tools used for electronic circuit construction given in Table 4.

Table 4: Tools.

	Tool	Name
i.	 *(Source: https://cpc.farnell.com/)*	_____ (0.5)
ii.	 *(Source: https://www.sparkfun.com/)*	_____ (0.5)
iii.	 *(Source: https://www.tomsonelectronics.com/)*	_____ (0.5)
iv.	 *(Source: https://circuit-electronics.com/)*	_____ (0.5)

This question continues on next page.

b. Identify, in the correct order, the first **FOUR** steps required to use a soldering iron effectively.

Step 1: _____

_____ (0.5)

Step 2: _____

_____ (0.5)

Step 3: _____

_____ (0.5)

Step 4: _____

_____ (0.5)

Step 5: Allow the solder joint to solidify appropriately.

c. Outline the function of the following **FOUR** tools used in the process of electronic circuit construction on a PCB board.

long nose plier	soldering iron	side cutter	solder wick

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ (4)

8

Question 7 **C-1 (12 marks)**

a. i. Describe the relationship between resistance, voltage and current.

_____

_____

_____

_____ (2)

ii. Write down the Ohm's Law equation and the SI unit for each parameter in the equation.

_____

_____

_____

_____ (2)

b. Determine the resistance using the current and voltage measurement of a resistor under test shown in Figure 3. Show all your workings.

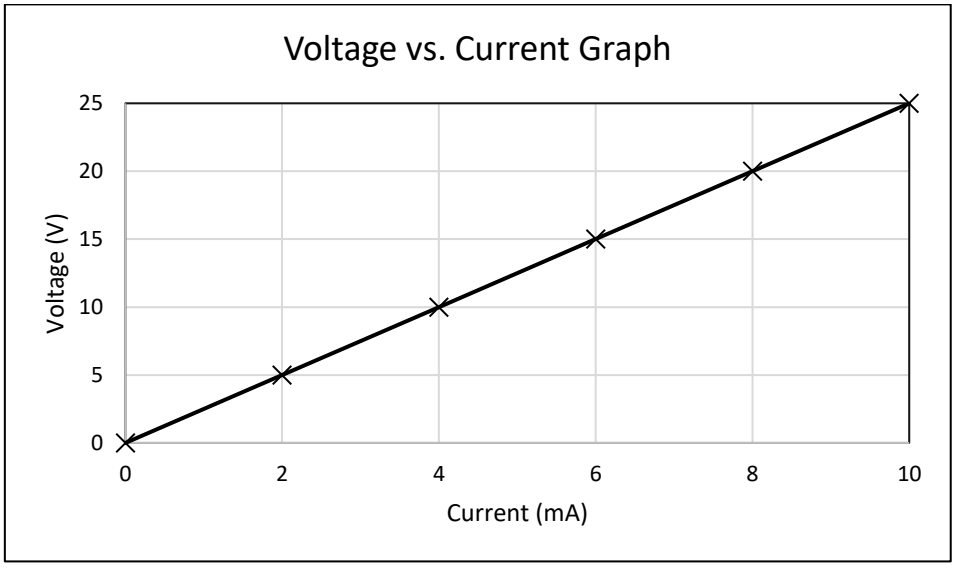


Figure 3: Voltage vs Current graph of a resistor

_____

_____

_____

_____

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(4)

c. The LED shown in the circuit in Figure 4 requires 2V and 20mA to operate in its optimal state. Calculate the value of resistance R1 in the circuit. Show all your workings.

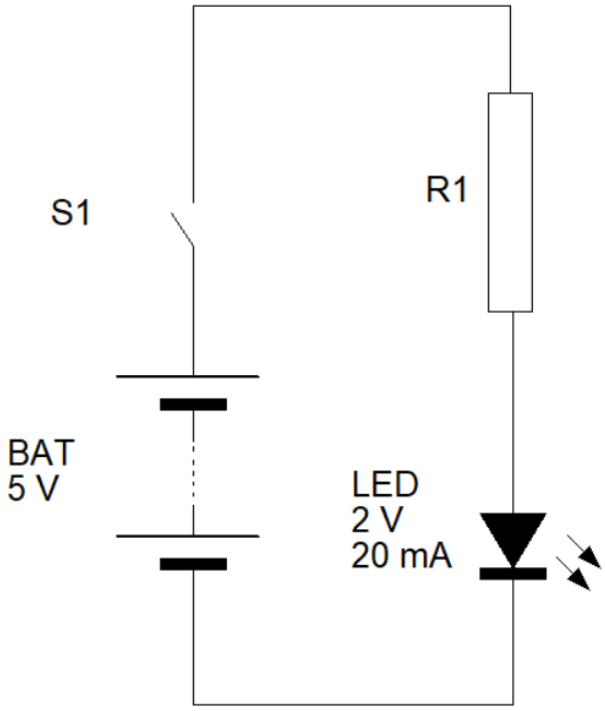

Figure 4: Circuit with missing unknown resistance R1

(4)

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Question 8 **C-4 (12 marks)**

a. List **FOUR** different types of Logic Gates and draw their respective symbols in the respective column in Table 5. (4)

b. Write the Truth Tables of the **FOUR** Logic Gates selected in Question 8(a) in the respective column in Table 5. (4)

Table 5: Logic Gates.

<table>
<tr><th></th><th>Name of Logic Gate</th><th>Symbol</th><th>Truth Table</th></tr>
<tr><td>i.</td><td></td><td></td><td><table><tr><th>Input 1</th><th>Input 2</th><th>Output</th></tr><tr><td>0</td><td>0</td><td></td></tr><tr><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td></td></tr></table></td></tr>
<tr><td>ii.</td><td></td><td></td><td><table><tr><th>Input 1</th><th>Input 2</th><th>Output</th></tr><tr><td>0</td><td>0</td><td></td></tr><tr><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td></td></tr></table></td></tr>
<tr><td>iii.</td><td></td><td></td><td><table><tr><th>Input 1</th><th>Input 2</th><th>Output</th></tr><tr><td>0</td><td>0</td><td></td></tr><tr><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td></td></tr></table></td></tr>
<tr><td>iv.</td><td></td><td></td><td><table><tr><th>Input 1</th><th>Input 2</th><th>Output</th></tr><tr><td>0</td><td>0</td><td></td></tr><tr><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>0</td><td></td></tr><tr><td>1</td><td>1</td><td></td></tr></table></td></tr>
</table>

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c. Determine the output of the multi-stage logic circuit shown in Figure 5. Show all your working in the Truth Table (Table 6) given below.

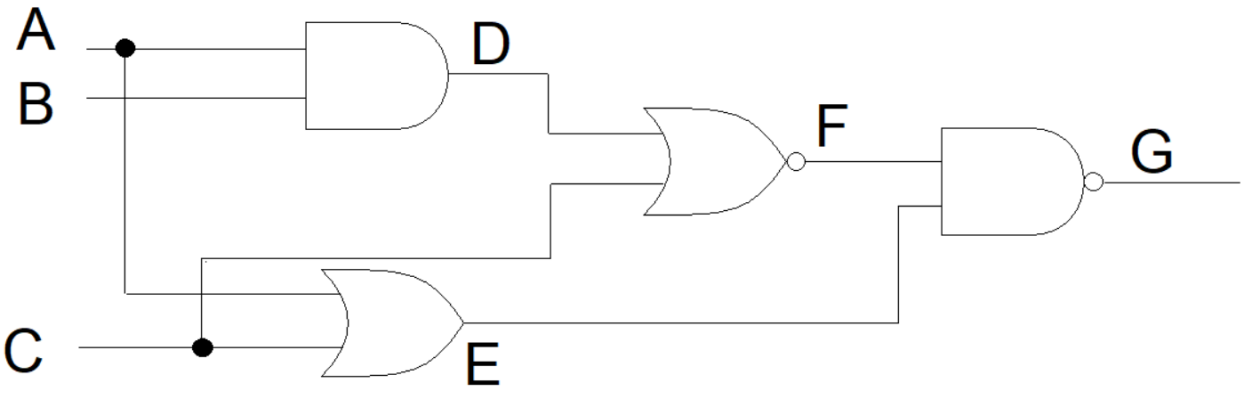

Figure 5: Circuit 3

Table 6: 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				

(4)

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