SUBJECT:

Class



## MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

## SECONDARY EDUCATION CERTIFICATE LEVEL 2021 MAIN SESSION

PAPER NUMBER: DATE:	Controlled – Unit 3 20 <sup>th</sup> May 2021
TIME:	10:00 a.m. to 11:35 a.m.
Name of candidate	
I.D. number	
School	

**Engineering Technology** 

Answer **ALL** questions in the space provided.

The use of non-programmable electronic calculators is allowed.

## **Scenario**

- A company which manufactures electronics for cars would like to employ an electronics technician.
- Answer all the questions to demonstrate that you are a suitable candidate for this post.

Question 1 K-1 (4 marks)

Identify the component corresponding to the schematic, pictorial or real-life representation provided in Table 1.

	Table 1 – Representations of electronic components.				
	Representations	Component name			
(a)	(Source: https://www.electronicshub.org/symbols/)				
(b)	(Source: https://www.electronicshub.org/symbols/)				
(c)	(Source: https://www.ebay.ie/itm)				
(d)	(Source: www.amazon.com)				
(e)	(Source: https://www.electronicshub.org/symbols/)				
(f)	(Source: https://www.electronicshub.org/symbols/)				
(g)	(Source: https://www.electronicshub.org/symbols/)				
(h)	(Source: https://www.switchelectronics.co.uk)				

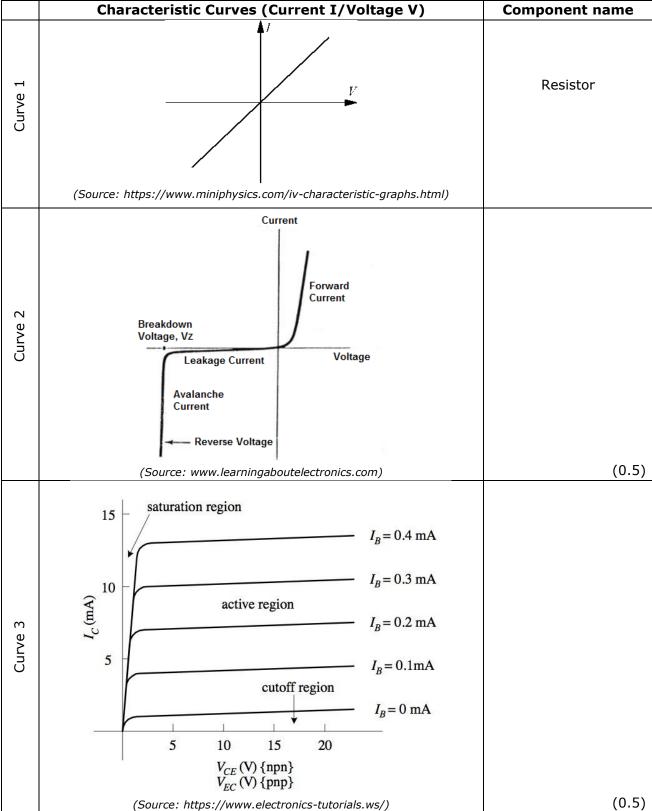
(i)	(Source: https://www.sparkfun.com)	
(j)	(Source: https://www.electrical-symbols.com/)	
(k)	(Source: www.amazon.com)	
(1)	(Source: www.amazon.com)	
(m)	(Source: www.amazon.com)	
(n)	GND[1 8] V <sub>cc</sub> TRIG[2 7] DISCH OUT[3 6] THRES RESET[4 5] CONT  (Source: https://www.electronicshub.org)	
(0)	(Source: www.amazon.com)	
(p)	(Source: www.amazon.com)	
		(4)

Please turn the page.

Question 2 C-2 (6 marks)

(a) Refer to the characteristic curves in Table 2 and answer the following questions. Name the components that correspond to the current-voltage characteristic curves 2 and 3 given in Table 2.

Table 2 – Characteristic curves of various electronic components.



(b)	Refe volta	r to the characteristic curve 1 and describe the relationship between currenge.	nt and
			(1)
(c)	Refe	r to the characteristic curve 2 and answer the questions below.	
	(i)	Describe how the component is connected in the forward region of the characteristic.	teristic
		cui ve.	
			(1)
	(ii)	Describe the relationship between voltage and current in the forward region.	` ,
	(11)	Describe the relationship between voltage and current in the forward region.	
			(1)

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(a)	кете	r to the characteristic curve 3 and explain what happens in the following regions:	
	(i)	Saturation Region	
			(1)
	(ii)	Active Region	
-			(1)

Question 3 K-4 (4 marks)

An electronics laboratory technician is required to test a circuit having different components combinations. The technician is required to measure voltage and current, and compare the results with the calculated values.

(a) Circuit 1 shown in Figure 1 is supplied by a 12V battery. R1 is 20  $\Omega$ , R2 is 60  $\Omega$  and R3 is 40  $\Omega$ .

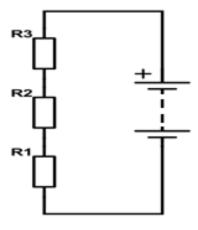


Figure 1 - Circuit 1

Calculate the voltage across the 60 $\Omega$ resistor (R2). Show all workings.		
	(1)	

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(b) Circuit 2 shown in Figure 2 is built on a breadboard. It is supplied by a 16V battery where R1 is 10  $\Omega$  and R2 is 40  $\Omega$ .

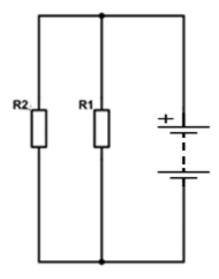
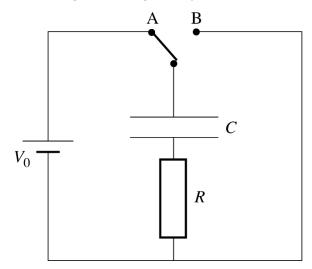


Figure 2 - Circuit 2

Calculate the total resistance, total current and the total power dissipated by the resisto ${\sf II}$ workings.	rs. Show
	(1)

The following circuit is used to charge/discharge a capacitor.

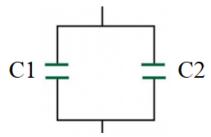


Source: https://www.physics.brocku.ca/PPLATO/h-flap/phys4\_5.html

	(c) Given that the circuit requires a time constant of 47s, calculate the value of the resistor R if the capacitor C is 1000uF.	ţ
_		
_		
_	(1)	_

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(d) The capacitor is not available in the store. The following circuit is used to replace the capacitor C having a value of 1000uF. Calculate the value of C1, if C2 is 680uF.

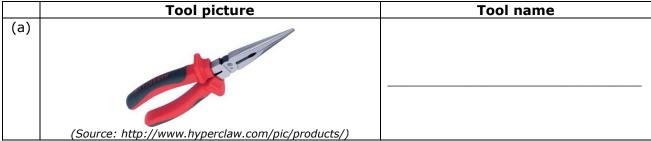


Question 4 K-5 (4 marks)

(1)

Various tools and equipment are used during the construction of electronic circuits. Fill in the name of the tool corresponding to each picture provided in Table 3.

Table 3 - Tools used to manufacture electronic circuits.



(b)	A LANGE OF THE PARTY OF THE PAR	
	(Source: https://mt.rsdelivers.com/product/rs-pro)	
(c)	(Source: https://mt.rsdelivers.com/)	
(d)	(Source: https://www.amazon.com/)	
(e)	(Source: https://www.amazon.co.uk/)	
(f)	(Source: https://www.autofactorswaterford.ie/product/)	
(g)	(Source: https://www.banzaimusic.com/)	
(h)	(Source: https://www.esr.co.uk/shop/contents/en-uk/)	

Please turn the page.

Question 5 C-5 (6 marks)

Electronic circuit boards are commonly used because they mechanically support and electrically connect circuit components. There are various electronic boards, each with its appropriate advantages and disadvantages.

Fill Table 4 below, by identifying **ONE** advantage and **ONE** disadvantage for each of the following electronic boards.

Table 4 – Advantages and Disadvantages of electronic boards.

	Electronic Board	e 4 – Advantages and Disadvantages of elec <b>Advantage</b>	Disadvantage
(a)	Breadboard		
		(1)	
(b)	Strip board		
(c)	РСВ	(1)	(1)
		(1)	(1)