| SUBJECT: | Engineering Technology |
| :--- | :--- |
| PAPER NUMBER: | Controlled - Unit 3 |
| DATE: | $20^{\text {th }}$ May 2021 |
| TIME: | $10: 00$ a.m. to $11: 35$ a.m. |

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

- 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) |  |
| (I) | (Source: www.amazon.com) |  |
| (m) |  |  |
| (n) |  |  |
| (o) | (Source: www.amazon.com) |  |
| (p) | (Source: www.amazon.com) |  |

## 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.

|  | Characteristic Curves (Current I/Voltage V) | Component name |
| :---: | :---: | :---: |
| $\begin{aligned} & -7 \\ & \stackrel{\rightharpoonup}{3} \\ & 0 \end{aligned}$ |  <br> (Source: https://www.miniphysics.com/iv-characteristic-graphs.html) | Resistor |
| $\begin{aligned} & \text { N } \\ & \stackrel{\sim}{3} \\ & \hline \end{aligned}$ | (Source: www.learningaboutelectronics.com) | (0.5) |
| m $\stackrel{0}{2}$ $\sim$ 0 |  <br> (Source: https://www.electronics-tutorials.ws/) | (0.5) |

(b) Refer to the characteristic curve 1 and describe the relationship between current and voltage.
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$\qquad$
$\qquad$
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$\qquad$
(c) Refer to the characteristic curve 2 and answer the questions below.
(i) Describe how the component is connected in the forward region of the characteristic curve.
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$\qquad$
(ii) Describe the relationship between voltage and current in the forward region.
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$\qquad$
$\qquad$
(d) Refer to the characteristic curve 3 and explain what happens in the following regions:
(i) Saturation Region
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
(ii) Active Region
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Question 3

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 12 V battery. R1 is $20 \Omega, \mathrm{R} 2$ is $60 \Omega$ and R3 is $40 \Omega$.


Figure 1 - Circuit 1

Calculate the voltage across the $60 \Omega$ resistor (R2). Show all workings.
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$\qquad$
(b) Circuit 2 shown in Figure 2 is built on a breadboard. It is supplied by a 16 V battery where R1 is $10 \Omega$ and $R 2$ is $40 \Omega$.


Figure 2 - Circuit 2
Calculate the total resistance, total current and the total power dissipated by the resistors. Show all workings.
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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 47 s , calculate the value of the resistor R if the capacitor C is 1000 uF .
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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 1000 uF . Calculate the value of C 1 , if C 2 is 680 uF .

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## Question 4

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.

|  | Tool picture | Tool name |
| :--- | :---: | :---: |
| (a) |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |


| b) | (Source: https://mt.rsdelivers.com/product/rs-pro) |  |
| :---: | :---: | :---: |
| (c) | (Source: https://mt.rsdelivers.com/) |  |
|  | (Source: https://www.amazon.com/) |  |
| ( |  |  |
| (f) | (Source: https://www.autofactorswaterford.ie/product/) |  |
| (g) |  |  |
| (h) | (Source: https://www.esr.co.uk/shop/contents/en-uk/) |  |

Please turn the page.

## Question 5

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.


