



SUBJECT: **Engineering Technology**
 PAPER NUMBER: Synoptic – Unit 2
 DATE: 1st November 2024
 TIME: 11:30 a.m. to 1:35 p.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	12	8	12	8	8	8	70

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

Scenario

- A number of technicians applied for the position of electronics technician at a company.
- As part of their assessment applicants are required to perform the following test designed to assess their knowledge in electronics.

Question 1

K-1 (6 marks)

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

Rubber	Steel	Fibreglass	Copper
Silver	Porcelain	Brass	Oil

Table 1: Conductors or Insulators.

Conductors	Insulators

(2)

b. Define the term semi-conductor.

(2)

c. Two pieces of wire with the same cross-sectional area, have different resistance. State the **TWO** other parameters that account for the difference in 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 series circuit consists of a 1.5 V battery and a series combination of 1 x 470 Ω resistor and a 1 x 910 Ω resistor.

(1)

ii. A 1.5 V battery supplies a parallel combination consisting of a 120 Ω resistor in parallel with a 220Ω resistor.

(1)

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c. Figure 1 illustrates a series-parallel circuit.

Identify the series combination and the parallel circuit combination by referring to the resistors R1, R2 and R3. Write your answers in the space provided below.

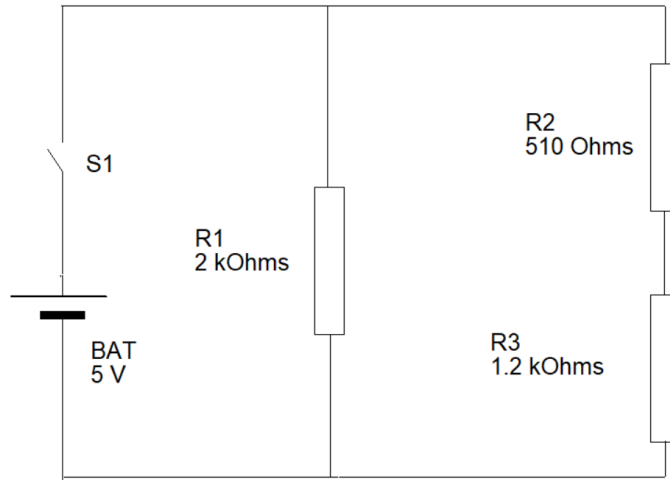


Figure 1: Series-parallel circuit

Series sub-circuit: _____ (2)

Parallel sub-circuit: _____ (2)

8

Question 3

C-2 (12 marks)

a. Find the total resistance of the circuit shown in Figure 2. Show all your working.

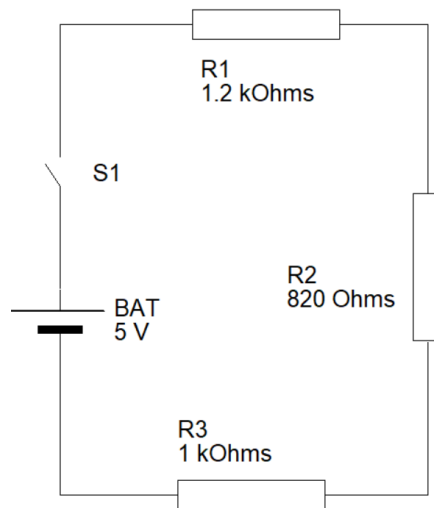




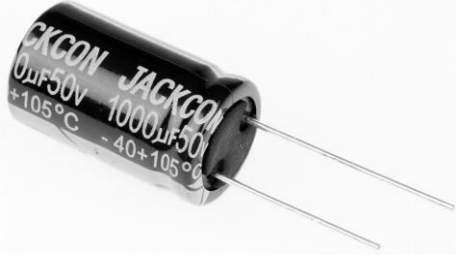
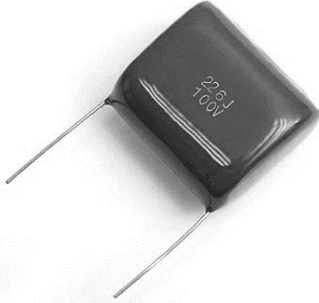
Figure 2: Circuit

Question 4

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.	 <p>(Source: https://www.mifraelectronics.com/)</p>	<p>_____</p> <p>(0.5)</p>
ii.	 <p>(Source: https://www.eu.mouser.com/)</p>	<p>_____</p> <p>(0.5)</p>
iii.	 <p>(Source: https://www.sg.rs-online.com)</p>	<p>_____</p> <p>(0.5)</p>
iv.	 <p>(Source: https://www.m.indiamart.com /)</p>	<p>_____</p> <p>(0.5)</p>

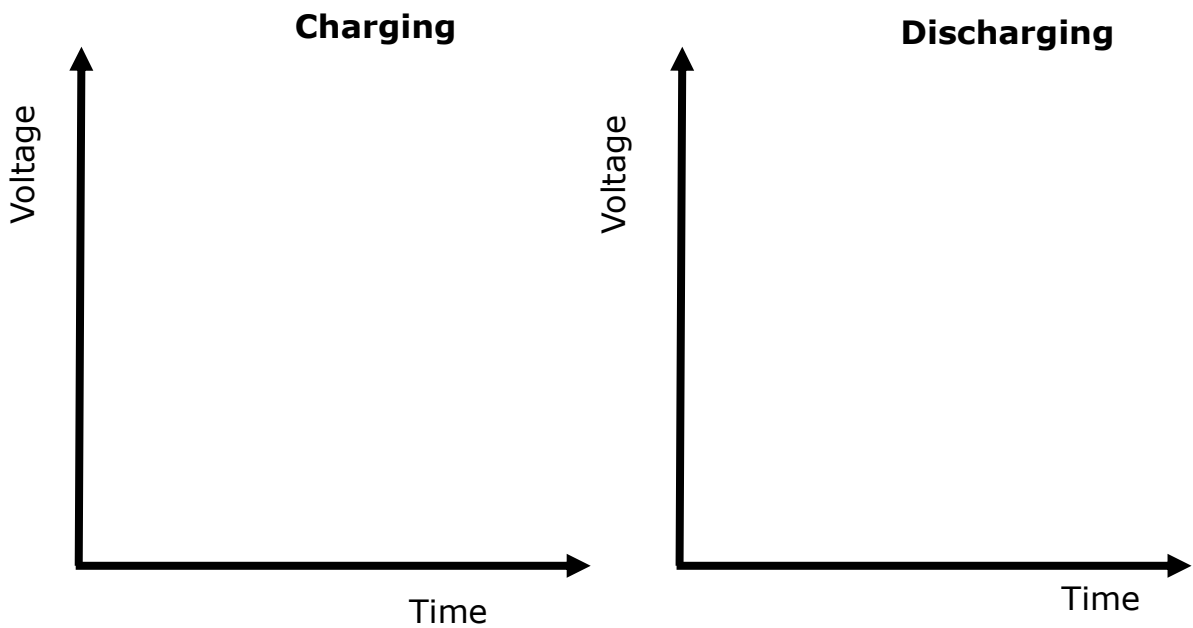
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b. Rank the following capacitor values in descending order starting from the largest to the smallest capacitor value.

510 pF , $2.2\text{ }\mu\text{F}$, 3300 nF , 0.015 mF , $0.002\text{ }\mu\text{F}$

- i. _____ (0.4)
- ii. _____ (0.4)
- iii. _____ (0.4)
- iv. _____ (0.4)
- v. _____ (0.4)

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



(4) 8

Question 5

C-3 (12 marks)

a. Find the total capacitance of the circuit shown in Figure 5 below. Show all your working.

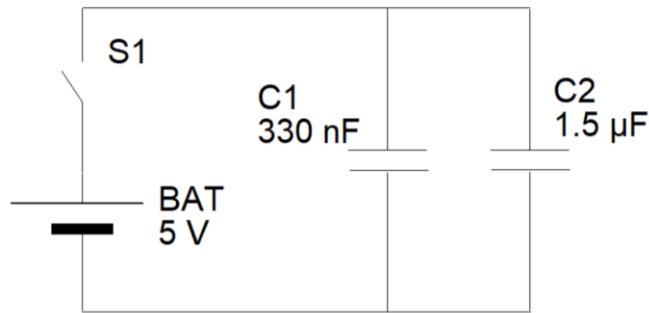


Figure 5: Circuit

(4)

b. Find the total capacitance of the circuit shown in Figure 6 below. Show all your working.

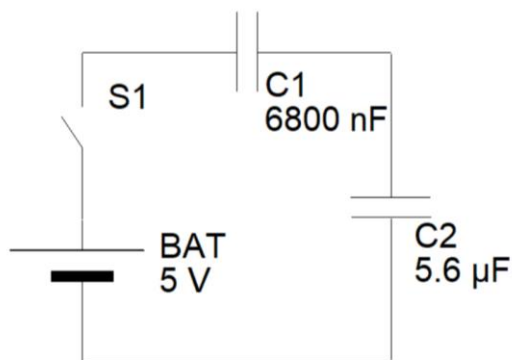


Figure 6: Circuit

(4)

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c. Find the capacitance value of the resistor R1 to attain a time constant of 1.23 s for the RC circuit shown in Figure 7.

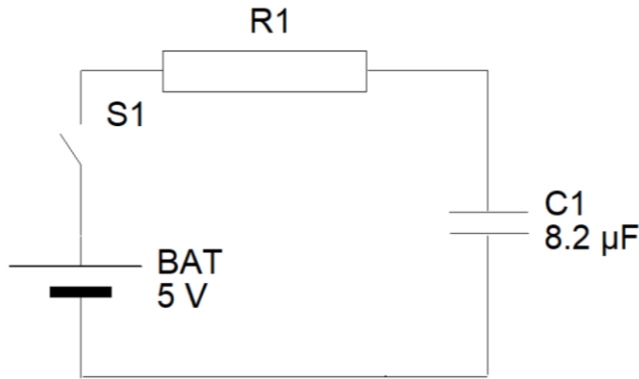


Figure 7: Circuit

(4)

12

Question 6

K-7 (8 marks)

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

Analogue device 1: _____ (1)

Analogue device 2: _____ (1)

b. For **each** analogue device listed in Question 6a, list **TWO** characteristics.

Analogue device 1

Characteristic 1: _____ (0.5)

Characteristic 2: _____ (0.5)

Analogue device 2

Characteristic 1: _____ (0.5)

Characteristic 2: _____ (0.5)

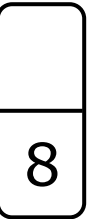
c. Describe the function of the analogue devices listed in Question 6a.

Function of the Analogue device 1: _____

_____ (2)

Function of the Analogue device 2: _____

_____ (2)



Please turn the page.

Question 7

K-8 (8 marks)

- a. Figure 8 below shows the Integrated Circuit (IC) diagram of the NE555 timer.
 - i. Identify the **FOUR** selected pin-outs of this IC by writing the corresponding pin number in the respective boxes.
 - ii. Identify the **TWO** pins named Pin A and Pin B in the space provided.

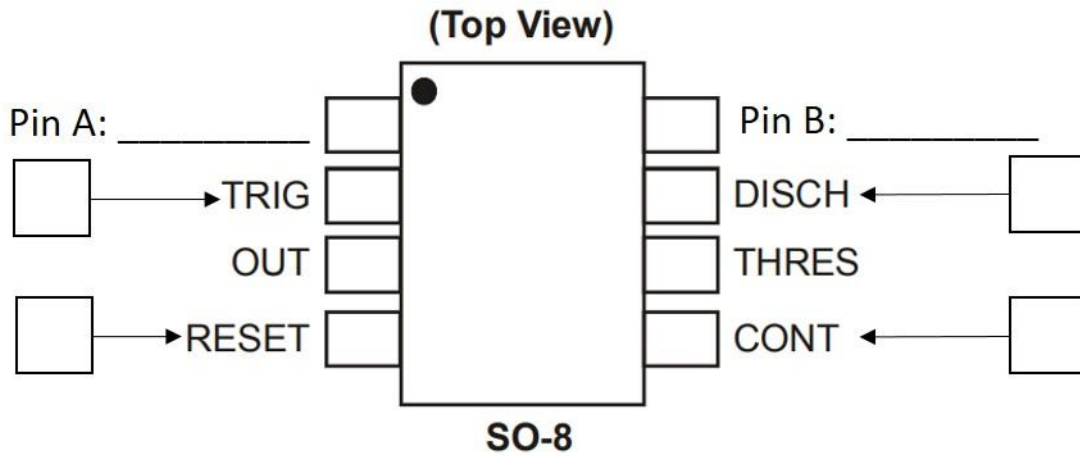


Figure 8: The NE555 timer IC

(2)

- b. List **FOUR** different physical characteristics of ICs.

Physical characteristic 1: _____ (0.5)

Physical characteristic 2: _____ (0.5)

Physical characteristic 3: _____ (0.5)

Physical characteristic 4: _____ (0.5)

- c. Describe **TWO** main advantages of using an IC in a circuit:

(4)

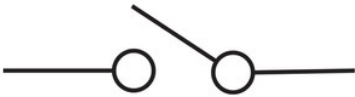
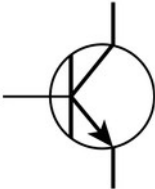
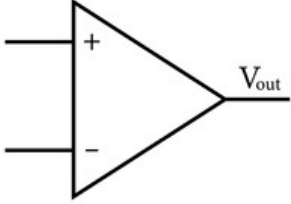
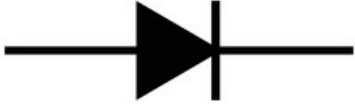
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Question 8

K-9 (8 marks)

a. Identify the **FOUR** electronic symbols shown in Table 3 below.

Table 3 – Electronic Symbols.

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

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

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

Amps

Farads

Ohms

Volts

Watts

Capacitance

Voltage

Current

Resistance



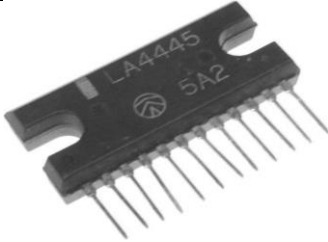
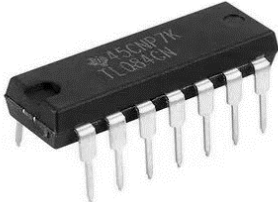


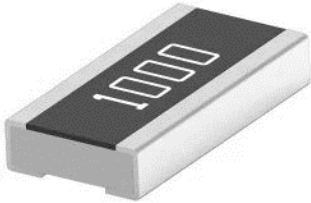

Power

(2)

c. Identify the different electronic component packages illustrated in Table 4, using terms from the ones provided below:

axial hollow	through hole dual-in-line	radial and surface mount axial and through hole	radial single-in-line	surface mount spigot
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Table 4 – Component Packaging

	Packaging 1	Packaging 2
i.	 _____ (Source: https://www.westfloridacomponents.com)	 _____ (Source: https://www.amazon.co.uk)
ii.	 _____ (Source: https://www.pinterest.co.uk/)	 _____ (Source: https://www.indiamart.com/)
iii.	 _____ (Source: https://www.nu-tech.us/)	 _____ (Source: https://www.trusteddiode.com/)
iv.	 _____ (Source: https://www.indiamart.com/)	 _____ (Source: https://www.switchelectronics.co.uk/)

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