



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**ELECTRONIC CONTROL AND DIGITAL ELECTRONICS  
NQF LEVEL 2**

(12041022)

**10 December 2020 (X-paper)  
09:00–12:00**

Calculators may be used.

This question paper consists of 6 pages.

485Q1N2010

**TIME: 3 HOURS  
MARKS: 100**

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**INSTRUCTIONS AND INFORMATION**

1. Answer all the questions.
  2. Read all the questions carefully.
  3. Start each question on a new page.
  4. Number the answers according to the numbering system used in this question paper.
  5. Write neatly and legibly.
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**QUESTION 1: COMPONENTS AND CIRCUIT DRAWING**

1.1 Define the following atomic terms:

1.1.1 Atomic number

1.1.2 Conductor 

1.1.3 Free electron

1.1.4 Ionised atom

(4 × 1) (4)

1.2 Identify the following components:

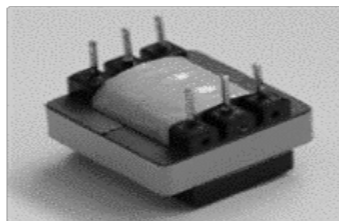
1.2.1



1.2.2



1.2.3



(3 × 1) (3)


1.3 Explain the function of a capacitor. (1)

1.4 Covalent bonding is the mutual sharing of electrons between atoms. 

With the aid of a diagram, explain *covalent bonding* using a water molecule (H<sub>2</sub>O). (4)

1.5 Explain what is meant by *majority charge carriers* in P-type material. (1)

1.6 Draw a half-wave rectifier circuit without showing the input and output wave. (5)

1.7 Briefly describe how a PNP transistor operates.  (4)

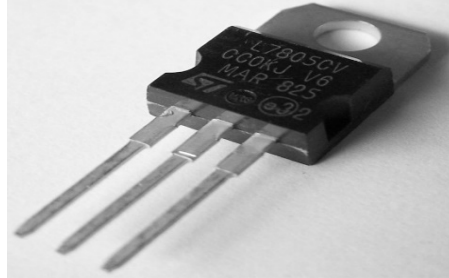
1.8 Name THREE specifications covered by transistor manufacturers. (3)

**[25]**

**QUESTION 2: COMPONENTS AND CIRCUIT DRAWING**

2.1 List THREE advantages of an integrated circuit. (3)

2.2 Answer the following questions about the component in FIGURE 1:



**FIGURE 1**

2.2.1 Identify the IC in FIGURE 1. (1)

2.2.2 Name the THREE pins of the IC in FIGURE 1. (3)

2.2.3 Explains the function of the IC in FIGURE 1. (2)

2.3 Draw the IEC symbols for the following:

2.3.1 Zener diode

2.3.2 Battery

2.3.3 LDR

(3 × 1) (3)


2.4 Use a sketch to show how one would connect a voltmeter when measuring a voltage. (2)

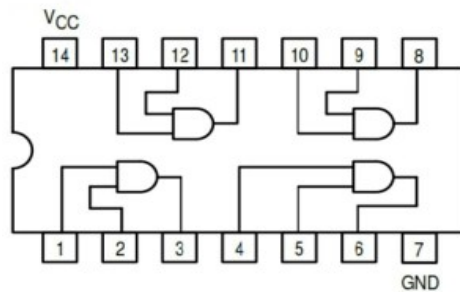
2.5 List FOUR steps on how one would reduce the risk of burns when adding or replacing a component. (4)

2.6 Name TWO damages that ESD causes in an electronic device. (2)


**[20]**

**QUESTION 3: DIGITAL ELECTRONICS**

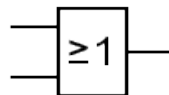
- 3.1 Explain how voltage levels are used to represent bits. (3)
- 3.2 Convert decimal number  $45_{10}$  to a primary number. (4)
- 3.3 Use 2's complement to subtract  $10110_2$  from  $1010_2$ . (6)
- 3.4 Define *parity*.  (1)
- 3.5 Draw a switching circuit for an AND gate. (4)
- 3.6 Analyse the integrated circuit in FIGURE 2 and answer the following questions:



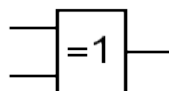
**FIGURE 2**

- 3.6.1 Name the type of gate in FIGURE 2. (2)
- 3.6.2 How many of those gates does the component in FIGURE 2 have? (2)
- 3.6.3 What are pins 7 and 14 used for?  (2)
- 3.7 State the difference between *latches* and *flip-flops*. (4)
- 3.8 Name the following gates:

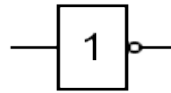
3.8.1



3.8.2



3.8.3



(3 × 1) (3)

3.9 Draw a truth table for a clocked RS flip-flop.



(4)  
[35]

**QUESTION 4: BASIC COMPUTER COMPONENTS**

4.1 Explain the function of the following components:

4.1.1 Hardware

4.1.2 Software

4.1.3 Bytes

4.1.4 Monitor



(4 × 1) (4)

4.2 Name TWO primary memories that are used to store data in a computer.

(2)

4.3 Explain how data is stored on a flash memory.

(4)  
[10]

**QUESTION 5: TRANSDUCERS USED IN PROCESS CONTROL**

5.1 State the function of the following transducers.

5.1.1 Manometer



5.1.2 Sight glass

5.1.3 Ball float

(3 × 1) (3)

5.2 Draw the construction of a photo diode.

(4)

5.3 Explain the operation of a thermistor.

(2)

5.4 Name ONE type of thermistor.

(1)  
[10]

**TOTAL: 100**