

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRONIC CONTROL AND DIGITAL ELECTRONICS

NQF LEVEL 3

SEPTEMBER 2019

INTERNAL EXAM

3 Hours

100 marks

INSTRUCTIONS:

1. Answer **ALL** the questions.
2. Read the instructions for each question carefully and do only what is required.
3. Number the answers correctly **according to the numbering systems** used in this assessment or make use of the answer books (Write down your name, surname and ID number on your answer sheet).
4. Please write neatly and legibly.
5. **ALL** work that you do not want to be marked must be clearly crossed out.

TOPIC ONE: FUNDAMENTALS OF ELECTRONICS

QUESTION 1

1.1

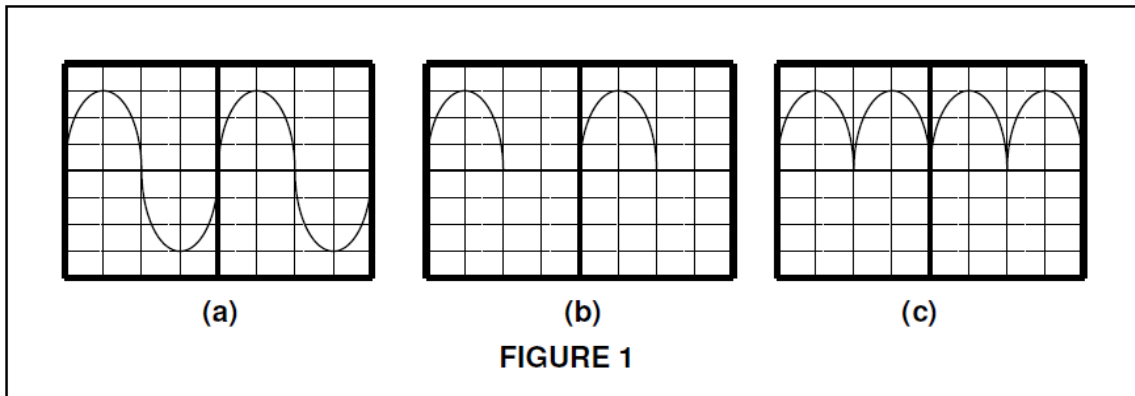


Figure 1 above shows **THREE** rectifier **OUTPUT** waveforms as displayed on the oscilloscope screen.

1.1.1 What is the fault you see with waveform (a)? (1)

1.1.2 What circuit would you use to get waveform (b)? (1)

1.1.3 If the V/DIV switch is set to 5V/DIV, what is the peak voltage of waveform (c)? (1)

1.2 Answer **TRUE** or **FALSE**:

1.2.1 You can always use an oscilloscope instead of a multimeter. (1)

1.2.2 DC is seen as a straight line on an oscilloscope. (1)

1.2.3 Digital waveforms can be measured using an oscilloscope. (1)

1.2.4 The T/DIV selector switch is used to determine frequency. (1)

1.3 1.3.1 What is the **FIRST** check you do before using any battery-powered instrument? (1)

1.3.2 How often should you check the leads and probes? (1)

1.4 If the input voltage selector switch at the back of an instrument is set to 110V, what will happen when you plug it into 220V? (1)

(10)

QUESTION 2

2.1 Match the following statements:

- | | | | |
|--|---|---------------------------------------|-----|
| 2.1.1 Free electrons... | A | Temperature | (1) |
| 2.1.2 The name for electron orbits is... | B | Are not bound to the atom | (1) |
| 2.1.3 Holes... | C | Large energy gap | (1) |
| 2.1.4 Insulators have a... | D | Are opposite in polarity to electrons | (1) |
| 2.1.5 The resistance of a conductor is affected by.... | E | Shells | (1) |

2.2

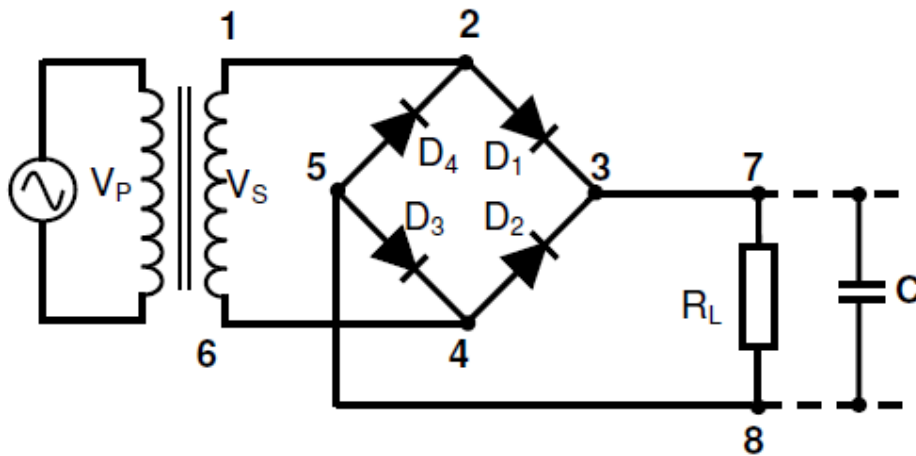


FIGURE 3

Use **FIGURE 3** to draw the voltage waveforms you would expect across:

- (a) Points 2 and 4 (1)
- (b) Points 3 and 5 (1)

2.3 When you are selecting a replacement transistor, you usually need to look up the specifications. What do the following represent:

- (a) H_{FE} (1)
- (b) V_{DS} (1)

2.4

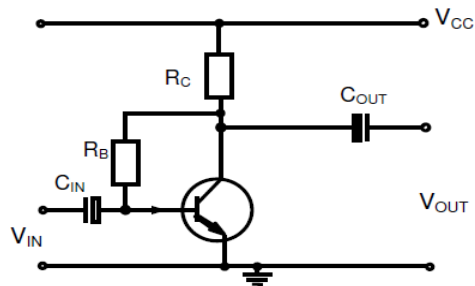


FIGURE 4

2.4.1 In **Figure 4**, what is the purpose of C_{IN} and C_{OUT} ? (1)

2.4.2 What is the voltage drop between base and emitter when switched on? (1)

2.4.3 What does V_{CC} represent? (1)

2.4.4 What is the voltage on the collector when the amplifier has 0V input? (1)

2.5

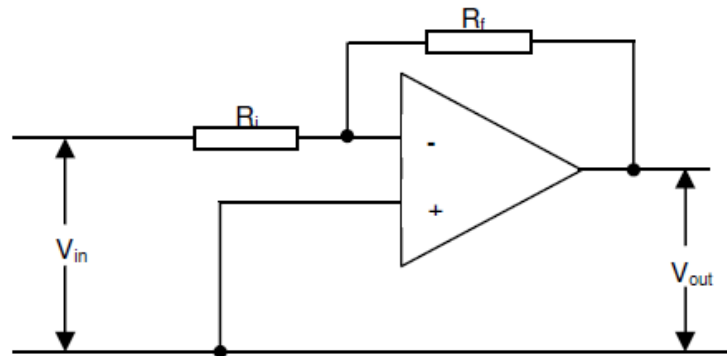


FIGURE 5

2.5.1 Why would we use the operational amplifier circuit in **FIGURE 5**? (1)

2.5.2 Name **TWO** other op-amp applications. (2)

2.5.3 Name **FOUR** characteristics of an ideal op-amp. (4)

2.6 Describe *thermal runaway*. (2)

2.7 Explain what you understand by *Electrostatic Discharge*. (2)

2.8 Why do we use a voltage regulator? (3)

- 2.9 What do the following acronyms stand for: (1)
- 2.9.1 JFET? (1)
- 2.9.2 BJT?
- 2.10 Why do we use anti-static bags for computer circuit boards and components like ICs and MOSFETS?. (1)

(30)

TOTAL TOPIC ONE [40]

TOPIC TWO: DIGITAL ELECTRONICS

QUESTION 3

- 3.1 Add $CD,8_{16} + 77,7_8$ **AND** write the answer in OCTAL. (5)
- 3.2 Divide 64_{10} by 1000_2 **AND** write the answer in DECIMAL. (5)
- 3.4 Multiply $10,1_2$ by $10,1_2$ **AND** write the answer in BINARY. (5)
- 3.5 Complete the top line of a truth table for a 4-bit counter:

		Q2	Q1
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(2)

- 3.6 With a drawing, use **THREE** JK flip-flops to show the difference between asynchronous and synchronous counters. (6)
- 3.7 Describe the difference between asynchronous and synchronous counters. (2)

TOTAL TOPIC TWO [25]

TOPIC THREE: ASSEMBLING A PERSONAL COMPUTER

QUESTION 4

- 4.1 What is the most **common data** connection for peripherals to a PC (personal computer)? (1)

- 4.2 You switch on your PC but **THERE IS NO PICTURE**.
- 4.2.1 What is the **FIRST** thing you will do? (1)
- 4.2.2 What might be the **FOUR** possible causes? (4)
- 4.3 What is a bus (in a computer)? (2)
- 4.4 Where is the **BIOS** located (in which chip) **AND** where would you find it? (2)
- 4.5 4.5.1 What is the advantage of using a **QUAD CORE** processor? (1)
- 4.5.2 What does **DUAL CORE** or **QUAD CORE** mean? (1)
- 4.6 Which keys **AND** in which sequence would you use to re-boot a computer? (3)

TOTAL TOPIC THREE [15]

TOPIC FOUR: TRANSDUCERS

QUESTION 5

- 5.1 What is the definition of a transducer? (1)
- 5.2 Answer as **TRUE** or **FALSE**:
- 5.2.1 A transducer signal is regarded as an **INPUT** signal to the controller. (1)
- 5.2.2 A transducer is **ALWAYS** located in the feedback loop of a process. (1)
- 5.2.3 A transducer may be used to measure level. (1)
- 5.3 Name **FIVE** requirements for selecting a suitable transducer. (5)
- 5.4 Name **ONE** variable that allows or affects measurement in a capacitive transducer. (1)

TOTAL TOPIC FOUR [10]

TOPIC FIVE: LADDER LOGIC AS USED IN PLCs

QUESTION 6

6.1

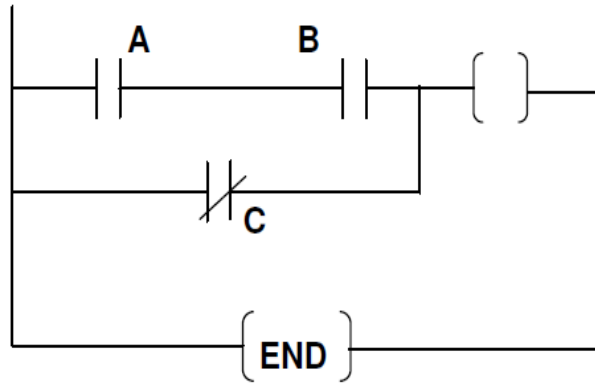


FIGURE 8

Complete the table below by referring to FIGURE 8:

INPUT A	INPUT B	INPUT C	OUTPUT
OFF	6.1.1	OFF	ON
OFF	OFF	ON	6.1.2
OFF	ON	OFF	6.1.3
ON	OFF	6.1.4	OFF
ON	OFF	ON	6.1.5
6.1.6	ON	OFF	ON

(6)

6.2 Draw a ladder logic diagram for a **NOR** logic gate

(4)

TOTAL TOPIC FIVE [10]

GRAND TOTAL [100]