higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N1

(8080641)

1 August (X-Paper)
09:00 – 12:00

This question paper consists of 6 pages and a formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
INDUSTRIAL ELECTRONICS N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Write neatly and legibly.

QUESTION 1

1.1 Choose a/an word/item from COLUMN B that matches a description in COLUMN A. Write only the letter (A – N) next to the question number (1.1.1 – 1.1.10) in the ANSWER BOOK.

	COLUMN A	COLUMN B
1.1.1	Blocks direct current	A an inductor
1.1.2	Is assembled from one piece of N-material and one piece of P-material	B a bridge rectifier
1.1.3	Is the number of cycles which pass a given point in one second	C a transistor
1.1.4	Is shared in a series resistor circuit	D a diode
1.1.5	It is the tolerance of a gold colour band	E a full-wave rectifier
1.1.6	Is assembled using two diodes	F voltage
1.1.7	Can be used as an electronic switch	G frequency
1.1.8	Possesses an ability to oppose any change in the existing current	H a transformer
1.1.9	The junction voltage of a silicon diode	I 5%
1.1.10	The charge on a hole	J 10%
		K 0,6 - 0,7 V
		L 0,2 - 0,3 V
		M positive
		N negative

(10 × 1) (10)

1.2 A 12-volt radio draws a current of 15 mA.

Calculate the following:

1.2.1 The power dissipated by the radio (3)

1.2.2 The minimum resistance of the radio (3)

1.3 Make a sketch of a bar magnet and show the magnetic lines of force and their direction around the bar magnet. (4)

1.4 State the left-hand rule for solenoids/coils. (3)

1.5 State the law of magnetism with respect to bar magnets. (2)
[25]

QUESTION 2

2.1 Name the units in which each of the following is measured:

2.1.1 Electromotive force (1)

2.1.2 A charge (1)

2.1.3 Frequency (1)

2.1.4 Resistance temperature coefficient (1)

2.1.5 Inductance (1)

2.2 Sketch the IEC symbols for each of the following components:

2.2.1 An inductor with a ferrite core (1)

2.2.2 An NPN transistor (1)

2.2.3 A pre-set capacitor (1)

2.2.4 A cell (1)

2.2.5 A saw-tooth wave (1)

2.3 Refer to FIGURE 1 below and calculate the following:

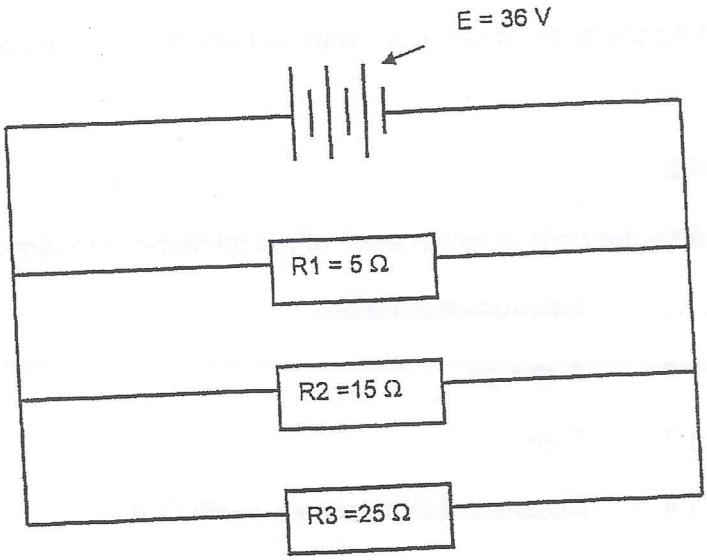

FIGURE 1

2.3.1 The total resistance in the circuit (5)

2.3.2 The total current flow through the circuit (3)

2.3.3 The voltage drop across R2 (1)

2.3.4 The current flow through R2 (3)

2.3.5 The power dissipated by R2 (3)
[25]

QUESTION 3

3.1 State FOUR factors that influence the resistance of a conductor. (4)

3.2 State THREE factors that influence the capacitance of a capacitor. (3)

3.3 State FOUR factors that determine the magnitude of an induced EMF in the conductor. (4)

3.4 Calculate the resistance of a 65-m long copper conductor with a cross sectional area of 28×10^{-6} mm^2. The resistivity of copper is 1,7 micro-ohm metres. (3)

3.5 A tube filled with mercury has a resistance of 23 Ω at 0 °C. If the tube is heated up to 45 °C, what will be its resistance? Take the resistance temperature coefficient of the tube as 0,0042 Ω/°C. (3)

3.6 A transformer with a supply voltage of 220 V has a turns ratio of 2:1.

Calculate the following:

3.6.1 The secondary voltage (4)

3.6.2 The secondary current if the primary current is 20 mA (4)
[25]

QUESTION 4

4.1 Indicate the following voltage readings for the circuit diagram below:

4.1.1 Across the silicon diode (2)

4.1.2 Across the lamp (2)

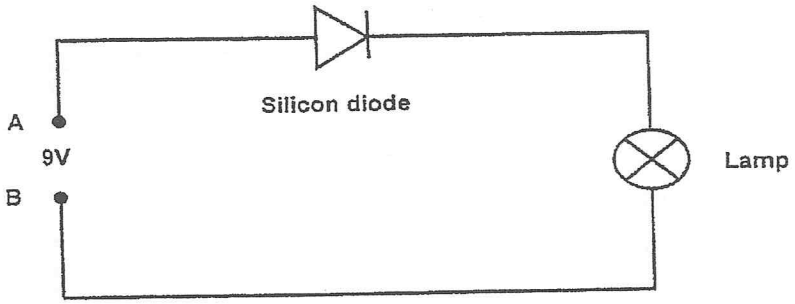

FIGURE 2

4.2 How many valence electrons does a germanium atom have? (1)

4.3 Explain what is meant by *covalent bond.* (2)

4.4 Explain the conditions under which a diode will conduct/pass current with respect to the polarity of the anode and the applied voltage. (4)

4.5 Name TWO types of multimeters. (2)

4.6 Define the term *induction.* (2)

4.7 Define the term *potential difference.* (3)

4.8 Make a neat, labelled sketch of a discharging curve for a capacitor. (3)

4.9 Make a neat, labelled sketch of a full-wave bridge rectifier circuit. (4)
[25]

TOTAL: 100

INDUSTRIAL ELECTRONICS N1

FORMULA SHEET

$$I = \frac{V}{R}$$

$$I = \frac{E}{R + r}$$

$$P = V \times I$$

$$R_t = R_1 + R_2 + \ldots + R_n$$

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots + \frac{1}{R_n}$$

$$C_t = C_1 + C_2 + \ldots + C_n$$

$$\frac{1}{C_t} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots + \frac{1}{C_n}$$

$$Q = C \times V$$

$$L_t = L_1 + L_2 + \ldots + L_n$$

$$\frac{1}{L_t} = \frac{1}{L_1} + \frac{1}{L_2} + \ldots + \frac{1}{L_n}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p}$$

$$R_t = R_o(1 + \alpha_o t)$$

$$R = \frac{\rho \ell}{A}$$