higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

RADIO THEORY N1

(11040851)

2 August 2019 (X-Paper)
09:00–12:00

This question paper consists of 6 pages and 1 formula sheet.

Copyright reserved

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
RADIO THEORY N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.

Copyright reserved

QUESTION 1

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 A free electron has a neutral charge.

1.2 An insulator is a material that easily conducts current.

1.3 Transformers can step up or step down a voltage.

1.4 Resistors limit current.

1.5 When capacitors are connected in parallel, the total capacitance increases.

1.6 An inductor is basically a coil of wire.

1.7 Speakers convert radio waves into sound waves.

1.8 Electrolytic capacitors are polarised.

1.9 Sound waves travel at the speed of light.

1.10 Transverse waves make use of the ionosphere for communication.

(10 × 1) **[10]**

QUESTION 2

2.1 A round conductor is 1 m long and has a diameter of 0,2 mm. Its resistivity is 0,0017 μΩ.m.

Determine the resistance of the conductor in ohms. (5)

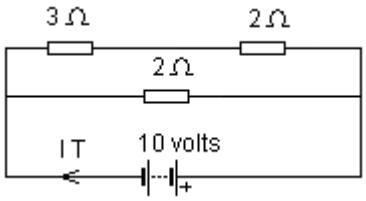
2.2 What are *free electrons*? (2)

2.3 Explain Kirchoff's first law. (3)

[10]

QUESTION 3

3.1 Study the circuit diagram below and answer the questions.



Calculate the following:

3.1.1 The total resistance (4)

3.1.2 The total current flowing (2)

3.1.3 The current flowing through the 3 Ω resistor (2)

3.2 Determine the voltage of a combination of six 2-volt cells connected in series. (2)
[10]

QUESTION 4

4.1 Name the FOUR factors that determine the strength of an electromagnet. (4)

4.2 Make a neat, labelled sketch of a bar magnet (3)

4.3 State Faraday's law. (3)
[10]

QUESTION 5

5.1 A moving-coil meter has a coil resistance of 100 ohms. A current of 12 mA moving through the coil gives full-scale deflection.

Calculate the value of a shunt resistor required to enable the meter to have a range of 0–2A. (3)

5.2 Make a neat, labelled sketch of a series-type ohmmeter using a moving coil meter. (4)

5.3 State THREE disadvantages of a moving-coil meter. (3)
[10]

Copyright reserved

QUESTION 6

6.1 Draw a neat, labelled sine wave that represents a 720° spread. Indicate on the drawing the peak value, peak-to-peak value and the time period. (4)

6.2 Explain the differences between *direct current* and *alternating current*. (4)

6.3 Give a definition of *frequency*. (2)
[10]

QUESTION 7

7.1 Make a neat, labelled sketch of a simple moving-coil speaker. (6)

7.2 Give the speed of light in m/s. (2)

7.3 Define AM modulation. (2)
[10]

QUESTION 8

8.1 Make a neat, labelled sketch to show how a diode can be connected in the forward-bias mode. Your sketch must include a diode, resistor and a battery. (3)

8.2 Give the difference between *intrinsic* and *extrinsic* semiconductor material. (2)

8.3 Make a neat, labelled sketch of the characteristic curves of a silicon diode. (5)
[10]

QUESTION 9

9.1 Draw the IEC symbols of the following components:

9.1.1 Inductor

9.1.2 Variable capacitor

9.1.3 Polarised capacitor

(3 × 1) (3)

9.2 The value of a resistor is 10 kΩ with a tolerance of 5%.

Give the colour code for this resistor. (4)

Copyright reserved

9.3 State TWO different types of polarised capacitors. (2)

9.4 What is the unit of capacitance? (1)
[10]

QUESTION 10

Draw a circuit diagram of a two-stage common emitter NPN transistor audio amplifier. The circuit diagram must include a microphone, speaker and battery. **[10]**

TOTAL: 100

Copyright reserved

(11040851)

RADIO THEORY N1

FORMULA SHEET

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

2. $R_T = R_1 + R_2 + R_{3...}$

3. $$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + ...$$

4. $$Rp = \frac{Im \, x Rm}{It - Im}$$

5. $$Rs = \frac{V}{Im - Rm}$$

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

7. $$A = \frac{\pi . D^2}{4}$$

8. $$F = \frac{1}{t}$$

9. $$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + ...$$

10. $L_T = L_1 + L_2 + L_{3...}$

11. $C_T = C_1 + C_2 + C_{3...}$

12. $$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + ...$$

Copyright reserved