higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

RADIO THEORY N1

(11040851)

13 April 2021 (X-paper)
09:00–12:00

Nonprogrammable calculators and drawing instruments may be used.

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

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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, in good proportion and may be done in pencil.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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QUESTION 1

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

1.1 An atom that has lost an electron is called a negative ion.

1.2 Transistors have two legs.

1.3 A secondary cell requires charging before it can produce an electrical current.

1.4 The component that limits current is called a diode.

1.5 When resistors are connected in parallel, the total resistance decreases.

1.6 Sound waves can move through a vacuum.

1.7 All magnets have a north and south pole.

1.8 Diodes conduct when they are forward biased.

1.9 Oscillators generate a frequency.

1.10 Capacitors can be used as filters in electrical circuits.

(10 × 1) **[10]**

QUESTION 2

2.1 Name and explain the TWO forces acting on an orbiting electron. (2 × 3) (6)

2.2 What are valence electrons? (2)

2.3 Give a brief explanation of an insulator. (2)

[10]

QUESTION 3

3.1 Two resistors with a value of 800 Ω and 1 kΩ respectively are connected in parallel with a 10 V DC supply.

3.1.1 Draw and label the circuit diagram. (2)

3.1.2 Calculate the total resistance. (3)

3.1.3 Calculate the total current. (2)

3.1.4 Calculate the voltage drop across the 800-ohm resistor. (1)

3.2 Explain the difference between the EMF and the potential difference of a cell of a battery. (2)

[10]

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QUESTION 4

4.1 Explain Fleming's right-hand rule. (3)

4.2 Make a neat, fully labelled sketch of two bar magnets to show how they would attract each other. Show the poles and direction of the magnetic field. (4)

4.3 Explain what is meant by inductance. (3)

[10]

QUESTION 5

A moving-coil meter has a coil resistance of 100 ohms. A current of 10 mA through the coil gives a full-scale deflection.

5.1 Calculate the value of the shunt resistor required to enable the meter to measure a current of 100 mA. (3)

5.2 Make a neat, labelled sketch to show how the shunt resistor is connected to the moving-coil meter and also show the direction of all the currents in the circuit. (4)

5.3 State THREE precautions when using a DC amperemeter. (3)

[10]

QUESTION 6

6.1 Make a neat, labelled sketch of a sine wave with a peak-to-peak value of 10 V. (4)

6.2 Give a definition of *frequency* with regard to radio waves. (2)

6.3 Make a neat, labelled sketch of a simple alternating-current generator. (4)

[10]

QUESTION 7

7.1 Are radio waves longitudinal waves or transverse waves? (1)

7.2 Make a neat, labelled sketch of a simple moving-coil microphone. (4)

7.3 What does the acronym AM stand for? (2)

7.4 Make a neat, labelled sketch to show how a sky wave is refracted from the ionosphere. (3)

[10]

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QUESTION 8

8.1 Transistors are found in most electronic equipment.

Give the function of the base, collector and emitter. (3)

8.2 Briefly describe the process of hole flow in a conductor. (3)

8.3 State ONE application of a diode. (1)

8.4 Explain doping with reference to semiconductors. (3)

[10]

QUESTION 9

9.1 Draw the IEC symbol of each of the following components:

9.1.1 Variable capacitor

9.1.2 Coil

9.1.3 Polarised capacitor

(3 × 1) (3)

9.2 The value of a resistor is 560 ohms with a tolerance of 5%.

Give the colour code for this resistor. (4)

9.3 Give another word for a potentiometer. (1)

9.4 State TWO applications of a transistor. (2)

[10]

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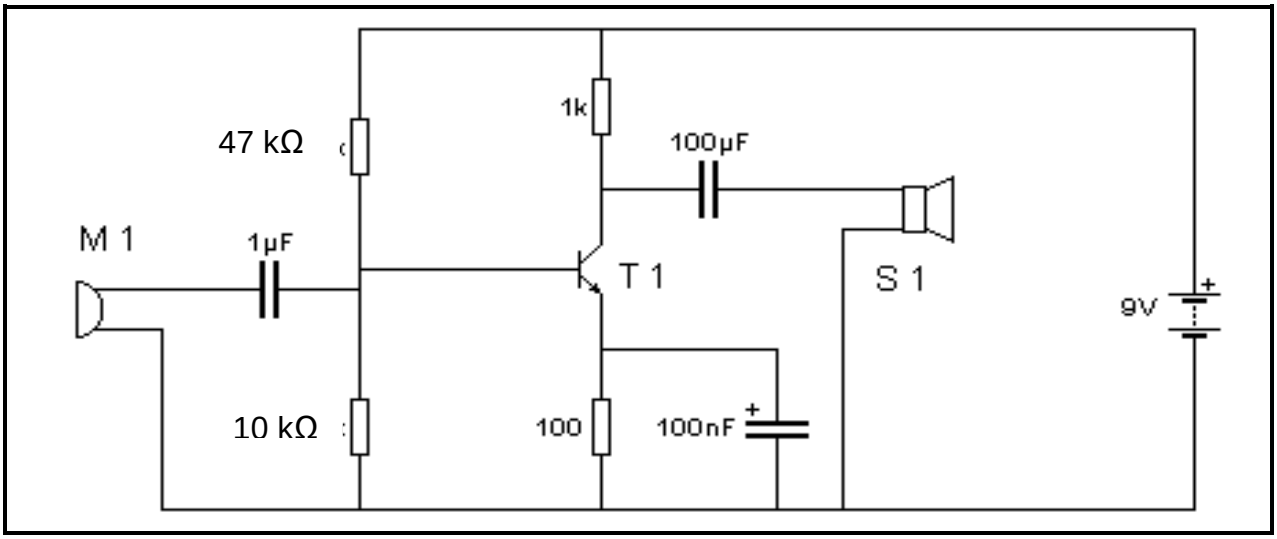
QUESTION 10

The sketch shows an electronic circuit diagram.



10.1 Name the circuit shown in the sketch. (1)

10.2 What is the function of the M1? (1)

10.3 What is the function of the S1? (1)

10.4 Name the component labelled 100 nF. (1)

10.5 Briefly explain the function of the combination of the 47 kΩ and 10 kΩ resistors. (2)

10.6 Name each leg of the component labelled T1. (3)

10.7 State the function of the component labelled 100 µF that you mentioned in QUESTION 10.4. (1)

[10]

TOTAL: 100

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RADIO THEORY N1

FORMULA SHEET

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

2. $R_T = R_1 + R_2 + R_3 \ldots$

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

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

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

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

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

8. $L_T = L_1 + L_2 + L_3 \ldots$

9. $C_T = C_1 + C_2 + C_3 \ldots$

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

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