higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1470**(E)**(A5)T

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N1

(11040821)

5 April 2018 (X-Paper)
09:00–12:00

Scientific calculators may be used.

This question paper consists of 5 pages and 1 formula sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
RADIO AND TELEVISION 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. Subsections of questions may NOT be separated.
5. Write neatly and legibly.

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QUESTION 1

A circuit consists of parallel resistors of 20 ohms and 100 ohms. The parallel combination is connected with a series resistor of 50 ohms supplied with a 12 V battery.

1.1 Construct the circuit above. (2)

1.2 Calculate each of the following using the information above:

1.2.1 Total resistance

1.2.2 Total current of the circuit

1.2.3 Voltage drop across 50 ohms

1.2.4 Power dissipation of the circuit

(4 × 2) (8)
[10]

QUESTION 2

2.1 Sketch the IEC symbols of each of the following components:

2.1.1 Zener diode

2.1.2 Variable capacitor

2.1.3 PNP transistor

(3 × 2) (6)

2.2 Make a neat, labelled circuit diagram of a full-wave rectifier power supply which uses a centre-tapped transformer. (4)
[10]

QUESTION 3

3.1 Draw a neat, labelled block diagram of an AM superheterodyne receiver. Indicate ALL the directions and interconnections. (10)

3.2 Name the component where each of the following functions in the block diagram in QUESTION 3.1 happens:

3.2.1 Receiving the transmitted signal

3.2.2 Removing the audio signal from the carrier

3.2.3 Converting electrical signal current to mechanical sound output

(3 × 2) (6)
[16]

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QUESTION 4

Explain the functions of each of the following in a monochrome television receiver:

4.1 Video detector

4.2 Sync separator

4.3 AGC

4.4 Tuner

(4 × 2) **[8]**

QUESTION 5

Draw a neat, labelled block diagram of a 625-line monochrome television receiver. Indicate ALL the directions and interconnections. **[12]**

QUESTION 6

Different types of radio wave propagation make communication between transmitters and receivers possible.

Make a neat, labelled sketch to show how a transmitter and receiver communicate via radio. The sketch must include the earth, ionosphere and the different radio waves. **[8]**

QUESTION 7

Define each of the following terms:

7.1 Limiter

7.2 Modulation

7.3 Demodulation

7.4 Filter

7.5 Heterodyning

(5 × 2) **[10]**

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QUESTION 8

An oscilloscope shows one cycle of a sinusoidal wave form. This wave form spans over four horizontal divisions and the peak-to-peak voltage spans over eight vertical divisions. The time/division switch is set to 30 milliseconds (ms) and the volt/division switch is set to 1 mV. The probe has a ratio of 1 : 1.

Calculate each of the following:

8.1 Time period

8.2 Frequency of the wave

8.3 RMS value

8.4 Average value of full-wave rectification

(4 × 3) **[12]**

QUESTION 9

9.1 Name FIVE uses of an oscilloscope in an electronic workshop. (5)

9.2 Name any THREE basic components of a CRT in an oscilloscope. (3 × 2) (6)
[11]

QUESTION 10

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (10.1–10.3) in the ANSWER BOOK.

10.1 The line and field frequencies in a television receiver are 70 hz and 300 hz. (1)

10.2 A diode passes current in two directions. (1)

10.3 The intermediate frequencies for an AM receiver are 8,8 hz. (1)
[3]

TOTAL: 100

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FORMULA SHEET

$V = 3 \times 10^8$ m/s

$V = I \times R$

$R_t = R_1 + R_2 + \ldots R_n$

$R = \frac{V^2}{P}$

$P = V \times I$

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

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

$m\% = \frac{A - B}{A + B_1} \times \frac{100}{1}$

$f = \frac{1}{T}$

$e = E_m \sin 2\pi ft$

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

$(emk = BLS) : emf = b/v$

$\lambda = \frac{V}{f}$

$I = \sqrt{\frac{P}{R}}$

$P = I^2 R$

$(c = r \times t)$

$I = I_m \sin 2\pi ft$

$R = \frac{P}{I^2}$

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