higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1430**(E)**(A4)
APRIL EXAMINATION

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N2

(11040832)

4 April 2016 (X-Paper)
09:00–12:00

Calculators may be used.

This question paper consists of 5 pages and 1 formula sheet of 2 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
RADIO AND TELEVISION THEORY N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully before answering them.
3. ALL the sketches and diagrams must be large, clear and neat.
4. Keep questions and subsections of questions together.
5. Number the answers according to the numbering system used in this question paper.
6. Show all the steps and calculations.
7. Write neatly and legibly.

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QUESTION 1

1.1 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 – 1.1.10) in the ANSWER BOOK.

1.1.1 The frequency of a wave is the number of repeated cycles per second.

1.1.2 For the transistor to operate as an amplifier the base emitter junction must be reverse biased.

1.1.3 In class C amplification current flows less than half of the input signal.

1.1.4 The process of combining radio frequencies with audio frequencies is termed demodulation.

1.1.5 During fly-back period, the electron beam is suppressed and this is known as audio.

1.1.6 The function of the luminance amplifier is to amplify the colour information to the highest level.

1.1.7 The CTR is coated with phosphor that emits visible light when bombarded by high velocity electrons.

1.1.8 An oscillator is a circuit that produces a regular pattern of waveforms, current or voltages.

1.1.9 Harmonics refer to a multiple of the frequency of a fundamental sine wave (the original sine wave).

1.1.10 Sweep generators are used to align the IF.

(10 × 1) (10)

1.2 Two capacitors of 5 µF and 10 µF are connected in series to a 12 Volt supply.

1.2.1 Calculate the total charge. (4)

1.2.2 The voltage across C 1. (2)

1.2.3 The voltage across C 2 (2)

[18]

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QUESTION 2

2.1 2.1.1 Name three types of non-polarised capacitors. (3)

2.2.2 Give TWO functions of a capacitor. (2)

2.2.3 Define the time constant of a capacitor. (3)

2.2 A 25 V/50 Hz voltage is obtained from the secondary of a step-down transformer.

Determine the following:

2.2.1 Peak voltage

2.2.2 RMS value

2.2.3 The wavelength

2.2.4 Generation period

2.2.5 Propagation distance

2.2.6 Calculate the frequency of the electromagnetic wave when travelling in free space if it has a wavelength of 1 000 m.

(6 × 2) (12)
[20]

QUESTION 3

3.1 A series RLC circuit consists of a resistor of 10 Ω, an inductor of 0.01 H and a capacitor of 75 µF connected to a 100 V/ 100 Hz supply.

Determine the following:

3.1.1 The inductive reactance.

3.1.2 The capacitive reactance.

3.1.3 The impedance of the circuit.

3.1.4 The magnitude of the current.

3.1.5 The phase angle.

(5 × 2) (10)

3.2 3.2.1 Name two disadvantages of AM. (2)

3.2.2 Draw a neatly labelled block diagram of an AM superhetrodine receiver. (6)
[18]

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QUESTION 4

4.1 State six characteristics of a common emitter amplifier (6)

4.2 Name five basic elements along with their functions, that make up a 625 line monochrome television set. (10)
[16]

QUESTION 5

5.1 Draw a neat labelled block diagram of a chrominance decoder. (10)

5.2 What is the function of a chrominance decoder? (1)
[11]

QUESTION 6

6.1 Draw a neat labelled circuit diagram of a phase shift oscillator. (7)

6.2 Name one advantage of a phase shift oscillator. (1)

6.3 Name one disadvantage of a phase shift oscillator. (1)
[9]

QUESTION 7

7.1 Name FOUR important equipment or instruments that are to be found in a radio or television workshop. (4)

7.2 Give FOUR advantages of a digital meter. (4)
[8]

TOTAL: 100

REFERENCES

1. Elskie, J.J.V. 2011. Radio and Television theory. Revised edition. Pretoria: Hercules.
2. Johnson, J.J. Fletcher, B.D. 1997. Introductory Radio and Television Electronics. London: Macmillan.

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FORMULA SHEET

RADIO AND TELEVISION THEORY N2

Capacitors in series
Kapasitors in serie:

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots$$

Capacitors in parallel
Kapasitors in parallel:

$$C_T = C_1 + C_3 + \cdots$$

Instantaneous voltage across a capacitor
Oombliklike spanning oor 'n kapasitor:

$$V_C = V\left(1 - e^{\frac{-t}{RC}}\right)$$

Initial charging current through a capacitor
Aanvanklike laaistroom deur 'n kapacitor:

$$i = \frac{V}{R} \times e^{\frac{-t}{RC}}$$

Time constant
Tydkonstante:

$$T = R \times C$$

Charge of capacitor
Lading van kapasitor:

$$Q = C \times V$$

AC THEORY/WS-TEORIE

Inductive reactance
Induktiewe reaktansie:

$$X_L = 2.\pi.F.L$$

Capacitance reactance
Kapasitiewe reaktansie:

$$X_c = \frac{1}{2.\pi.F.L}$$

Impedance for RL, RC, and RLC circuits
Impedansie vir RL, RC, en RLC-kringe:

$$Z = \sqrt{R^2 + X_L^2} \qquad Z = \sqrt{R^2 + X_c^2}$$

$$Z = \sqrt{R^2 + (X_L \simeq X_C)^2}$$

Circuit current for RL, RC, and RLC circuits
Kringstroom vir RL, RC, en RLC-kringe:

$$I_T = \frac{V}{X_L} \qquad I_T = \frac{V}{X_c}$$

$$I_T = \frac{V}{Z}$$

Voltage drop across components
Spanningsval oor komponente:

Power factor
Kragfaktor:

$$\cos\theta = \frac{R}{Z}$$

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Phase angle
Fasehoek:

$$\emptyset = \cos^{-1}\frac{R}{Z}$$

Resonant frequency
Resonansiefrekwensies:

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

Q-factor/
Q-faktor:

$$Q = \frac{1}{R}.\sqrt{\frac{L}{C}}$$

OHM'S LAW/OHM SE WET

Resistors in series
Weerstande in serie:

$$R_T = R_1 + R_2 \ldots$$

Resistors in parallel
Weerstande in parallel:

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

Voltage drop
Spanningsval:

$$V = I \times R$$

Circuit current
Kringstroom:

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

OSCILLOSCOPE CALCULATIONS/OSSILLOSKOOPBEWERKINGS

Period = Time/Division $\times$ Horizontal divisions
Periode $=$ Tyd/Divisie $\times$ Horisontale divisies

Amplitude $=$ Volts/ Division $\times$ Vertical divisions
Amplitude $=$ Volt/Divisie $\times$ Vertiktale divisies

Frequency $= \frac{1}{Period}$
Frekwensie $= \frac{1}{Periode}$

RMS voltage $= 0{,}707 \times Peak$
WGK-spanning $= 0{,}707 \times Piek$
Average voltage $= 0{,}637 \times Peak$
Gemiddelde spanning $= 0{,}637 \times Piek$
Voltage (Peak-to-Peak) $= 2 \times Peak$
Spanning (Piek-tot-Piek) $= 2 \times Piek$

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