higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1390(E)(A17)T
APRIL EXAMINATION

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N2

(11040832)

17 April 2015 (Y-Paper)
13:00–16:00

Calculators may be used.

This question paper consists of 5 pages and a 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.
3. Number the answers according to the numbering system used in this question paper.
4. ALL the sketches and diagrams must be large, clear and neat.
5. Keep questions and subsections of questions together.
6. Show all the steps and calculations.
7. Write neatly and legibly.

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QUESTION 1

1.1 Complete the following sentences/paragraph(s) by filling the missing word(s). Write only the word(s). Write only the word(s) next to the question number (1.1.1–1.1.4) in the ANSWER BOOK.

1.1.1 Capacitors can be divided into two main groups, namely, (a) … and (b) … (2)

1.1.2 Capacitors bloc (a) … and pass (b) ... freely. (2)

1.1.3 TWO types of polarised capacitors are (a) ... and (b) ... (2)

1.1.4 Factors that influence the ability of a capacitor to store a charge are (a) ... (b) ... and (c) ... (3)

1.2 A series RLC circuit consists of a 180 Ω, an inductor of 0.25 H and a capacitor of 22 µF connected to a 115 V/ 50 Hz supply.

Determine the following:

1.2.1 The inductive reactance

1.2.2 The capacitive reactance

1.2.3 The impedance of the circuit

1.2.4 The total current

1.2.5 The phase angle

(5 × 2) (10)
[19]

QUESTION 2

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

2.2 A 9 volt battery is connected across a 0.01 µF capacitor in series with a 120 KΩ resistor.

Determine the following:

2.2.1 The time constant of the circuit (3)

2.2.2 The voltage across the capacitor after 2 ms (2)

2.2.3 The voltage across the resistor (3)

2.2.4 The instantaneous current after 1 ms (3)

2.2.5 The instantaneous current after 2 ms (2)
[16]

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QUESTION 3

3.1 Draw the characteristic curves of a common emitter amplifier and indicate all the regions with the Q – point. (5)

3.2 What is the purpose of an emitter resistor in a common emitter amplifier? (2)

3.3 What is the purpose of an emitter capacitor in a common emitter amplifier? (2)

3.4 What is the purpose of an emitter resistor and emitter capacitor combined in a common emitter amplifier? (3)
[12]

QUESTION 4

4.1 Draw a neat, fully labelled block diagram of an oscilloscope and indicate the direction of the signal flow. (8)

4.2 List EIGHT controls of an oscilloscope and include their functions. (8)
[16]

QUESTION 5

5.1 Draw a neat, fully labelled block diagram of an FM superheterodyne radio receiver and indicate the direction of the signal flow. (10)

5.2 Write the following in full:

5.2.1 FM

5.2.2 Hi-fi

5.2.3 Imarsat

(3 × 2) (6)
[16]

QUESTION 6

Draw a fully labelled block diagram of a 625 line colour television receiver. **[15]**

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QUESTION 7

Explain the functions of the following stages of a monochrome television set:

7.1 Blanking (2)

7.2 Synch separator (2)

7.3 Line time base (2)
[6]

TOTAL: 100

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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/
Aanvanklikelaaistroomdeur '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/
Induktiewereaktansie:

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

Capacitance reactance/
Kapasitiewereaktansie:

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

Impedance for RL, RC, and RLC circuits/
Impedansievir RL, RC, en RLC-kringe:

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

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

Circuit current for RL, RC, and RLC circuits/
Kringstroomvir RL, RC, en RLC-kringe:

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

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

Voltage drop across components/
Spanningsvaloorkomponente:

$$V_R = I \times R V_L = I \times X_L$$

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$V_C = I \times X_C$

Power factor/ $\cos\theta = \frac{R}{Z}$

Kragfaktor:

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

Fasehoek:

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

Resonansiefrekwensies:

Q-factor/ $Q = \frac{1}{R}\cdot\sqrt{\frac{L}{C}}$

Q-faktor:

OHM'S LAW/OHM SE WET

Resistors in series/ $R_T = R_1 + R_2 \ldots$

Weerstande in serie:

Resistors in parallel/ $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} \ldots$

Weerstande in parallel:

Voltage drop/ $V = I \times R$

Spanningsval:

Circuit current/ $V = \frac{V}{R}$

Kringstroom:

OSCILLOSCOPE CALCULATIONS/OSSILLOSKOOPBEWERKINGS

Period = Time/Division × Horizontal divisions

Periode=Tyd/Divisie × Horisontaledivisies

Amplitude = Volts/Division × Vertical divisions

Amplitude = Volt/Divisie × Vertiktaledivisies

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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