higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1240**(E)**(N22)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N2

(11040832)

22 November 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.
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

Define the following terms:

1.1 Aspect ratio

1.2 Carrier frequency

1.3 Compatibility

1.4 Luminance signal

1.5 Persistence of vision

1.6 Scanning

1.7 Tuner

1.8 Transducer

1.9 Line time-base

1.10 Beam limiter

(10 × 2) **[20]**

QUESTION 2

2.1 A series RLC circuit consists of a 10 Ω resistor, an inductor reactance of 6,283 Ω and a capacitor reactance of 21,22 Ω connected to a 100 V/100 Hz supply.

Draw the circuit and determine the following: (4)

2.2 The value of the inductor (2)

2.3 The value of the capacitor (2)

2.4 The impedance of the circuit (2)

2.5 The total current (2)

2.6 The phase angle (2)

2.7 The voltage across each component (6)
[20]

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QUESTION 3

3.1 Draw a neat, labelled circuit diagram of an NPN emitter-follower amplifier. (8)

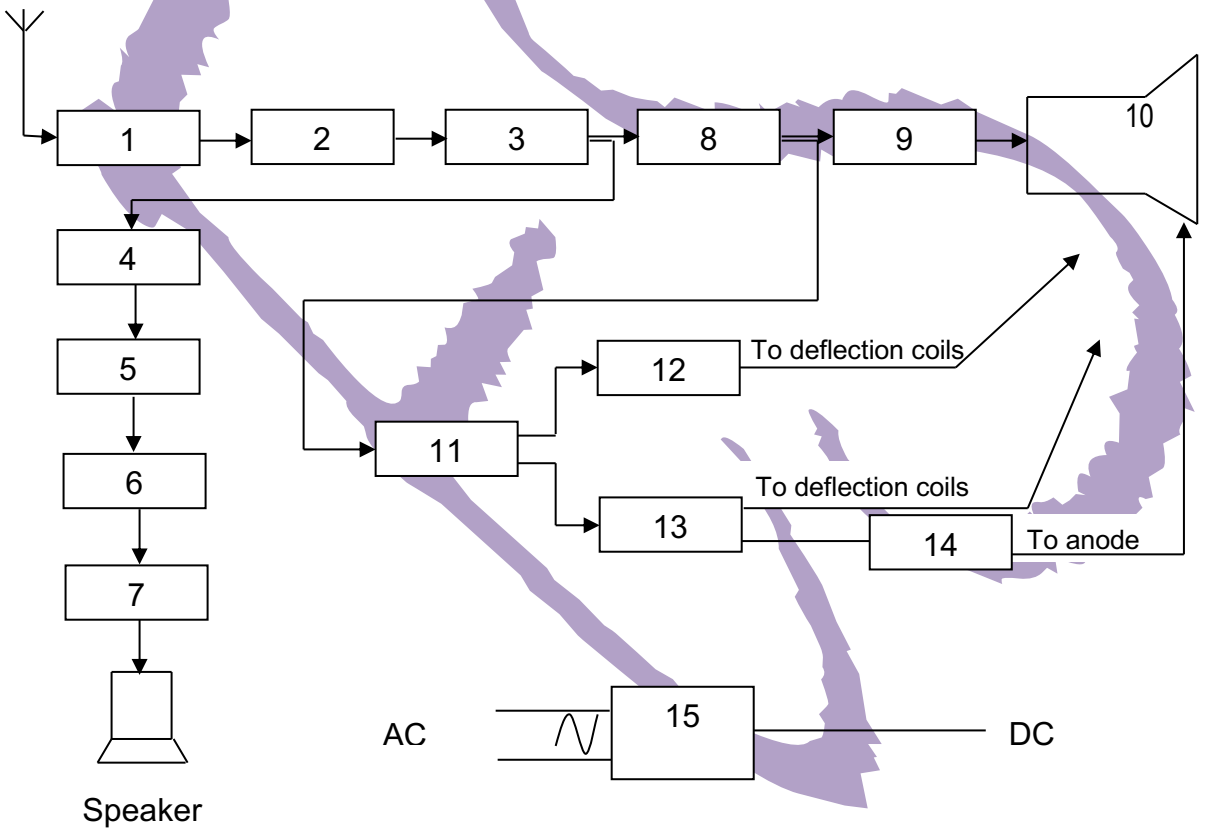
3.2 Give the characteristics of an emitter-follower amplifier. (6)
[14]

QUESTION 4

Draw a neat, labelled circuit diagram of a Foster-Seely discriminator. **[10]**

QUESTION 5

The following is a block diagram of a monochrome television receiver. Name ALL the blocks from 1 to 15.



[15]

QUESTION 6

6.1 Draw a neat, labelled circuit diagram of a chrominance decoder. (7)

6.2 Give SIX advantages a digital meter has over an analogue meter. (6)
[13]

QUESTION 7

An oscilloscope displays one cycle of a sinusoidal waveform. This waveform spans over four times the base unit and the peak-peak voltage over eight amplitude units. The time/division switch is set at 30 m/s and the volt/division is set at 1 mV. The probe used has a ratio of 1 : 1.

Determine the following:

7.1 The period which the wave is displayed

7.2 The frequency of the wave

7.3 The RMS voltage

7.4 The average voltage

(4 × 2) **[8]**

TOTAL: 100

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RADIO AND TELEVISION THEORY N2

FORMULA SHEET

CAPACITOR CALCULATIONS/KAPASITORBEWERKINGS

Capacitors in series/
Kapasitors in serie:

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

Capacitors in parallel/
Kapasitors in parallel:

$$C_T = C_1 + C_2 + ...$$

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 kapasitor:

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

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:

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

Capacitive reactance/
Kapasitiewe reaktansie:

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

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

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

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

$$I_T = \frac{V}{X_L} \quad I_T = \frac{V}{X_C} \quad I_T = \frac{V}{Z}$$

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Voltage drop across components/
Spanningsval oor komponente: $V_R = I \times R \quad V_L = I \times X_L \quad V_C = I \times X_C$

Power factor/
Kragfaktor: $Cos\ \theta = \frac{R}{Z}$

Phase angle/
Fasehoek: $\phi = Cos^{-1}\ \frac{R}{Z}$

Resonant frequency/
Resonansiefrekwensie: $f_r = \frac{1}{2\ .\ \pi\ .\ \sqrt{L\ .\ C}}$

Q-factor/
Q-faktor: $Q = \frac{1}{R\ .}\sqrt{\frac{L}{C}}$

OHM'S LAW/OHM SE WET

Resistors in series/
Weerstande/resistors in serie: $R_T = R_1 + R_2 + ...$

Resistors in parallel/
Weerstande/resistors in parallel: $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + ...$

Voltage drop/
Spanningsval: $V = I \times R$

Circuit current/
Kringstroom: $I = \frac{V}{R}$

OSCILLOSCOPE CALCULATIONS/OSSILLOSKOOPBEWERKINGS

Period = Time/Division × Horizontal divisions
Periode = Tyd/Divisie × Horisontale divisies

Amplitude = Volts/Division × Vertical divisions
Amplitude = Volt/Divisie × Vertikale divisies

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

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

RMS voltage = 0,707 × Peak
WGK-spanning = 0,707 × Piek

Average voltage = 0,637 × Peak
Gemiddelde spanning = 0,637 × Piek
Voltage (Peak-to-peak) = 2 × Peak
Spanning (Piek-tot-piek) = 2 × Piek

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