higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

ENGINEERING

T1360(E)(J22)T

JULY EXAMINATION

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N2

(11040832)

22 JULY 2014 (Y-Paper)
13:00–16:00

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

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DEPARTMENT OF EDUCATION
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 on this question paper.
6. Show all the steps and calculations.
7. Write neatly and legibly.

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QUESTION 1

1.1 Complete the following sentences by filling the missing word(s). Write only the word(s) next to the question number (1.1.1a–1.1.2b) in the ANSWER BOOK.

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

1.1.2 Capacitors block (a) ... and allow (b)... to pass freely. (2)

1.2 Define time constant of a capacitor. (3)

1.3 A 2,35 µF capacitor is connected in series with a15 KΩ resistor to a 15 volt supply. Assume no initial charge is across the capacitor meaning t = 0.

Calculate the following:

1.3.1 The time constant of the circuit (3)

1.3.2 The voltage across the capacitor after one time constant (4)
[14]

QUESTION 2

2.1 A series RLC circuit consists of a 68 µF capacitor, a resistor of 100 Ω and an inductor of 75 mH connected to a 120 volt 100 Hz supply. (4)

Draw the circuit.

Determine the following:

2.2 The inductive reactance (2)

2.3 The capacitive reactance (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 Name the THREE semi conductor layers that make up a transistor. (1)

3.2 Draw the characteristic curves of a common emitter amplifier and indicate all the operating regions. (5)

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

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

3.5 What is the purpose of an emitter resistor and emitter capacitor combined in a common emitter amplifier? (3)
[13]

QUESTION 4

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

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

QUESTION 5

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

5.2 Write the following in full:

5.2.1 FM (2)

5.2.2 Hi – Fi (2)

5.2.3 Imarsat (2)
[16]

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QUESTION 6

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

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:

$$C_T = C_1 + C_2 + \cdots$$

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 kapasitor:

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

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:

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

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

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

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

Voltage drop across components/
Spanningsval oor komponente:

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

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$$V_C = I \times X_C$$

Power factor/
Kragfaktor:

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

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 × 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 $= 0,707 \times Peak$
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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