higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1420**(E)**(A6)T

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N2

(11040832)

6 August 2019 (X-Paper)
09:00–12:00

Calculators may be used.

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

Copyright reserved

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. Write neatly and legibly.

Copyright reserved

QUESTION 1

Choose the correct option from those given in brackets. Write only the option next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Pattern bar generators provide (10 kHz/1 kHz) sound output for audio circuit repairs.

1.2 The luminance travels (faster/slower) than the chrominance through the luminance circuitry.

1.3 If a 'dead stage' is detected in the video detector stage, the (diode/transistor) is immediately checked for a faulty condition.

1.4 The power gain of a transistor connected in the common emitter mode is (unity/high).

1.5 To calculate the instantaneous voltage of a sine wave we need the(cos/sin) of the angle θ.

1.6 Capacitors can be either (polarised/magnetised) or (non-polarised/non-magnetised).

1.7 In a series resonant circuit the impedance is equal to (X_L/R).

1.8 The local oscillator's frequency is always set to the (RF/IF) above the incoming frequency.

1.9 To maintain a relatively constant picture under varying reception conditions, (AGC/AVC) is used to alter the gain of the IF amplifiers.

1.10 Crystal oscillators are popular because of their (high/low) sensitivity.

(10 × 1) **[10]**

QUESTION 2

2.1 Two capacitors, with a value of 100 µF and 200 µF respectively, are connected in parallel across a 100 V DC supply.

Determine:

2.1.1 The total charge

2.1.2 The voltage drop across each capacitor

(2 × 4) (8)

Copyright reserved

2.2 Make a sketch of the circuit symbols of the following types of capacitors:

2.2.1 Fixed capacitor

2.2.2 Polarised capacitor

2.2.3 Variable capacitor

2.2.4 Trimmer capacitor

(4 × 2) (8)

2.3 A 400 kΩ resistor is connected in series with a 200 µF capacitor across a 50 V DC supply.

Determine:

2.3.1 The time constant of the circuit

2.3.2 The time taken to charge the capacitor to its full capacity

(2 × 2) (4)
[20]

QUESTION 3

Draw a neat, labelled circuit diagram of a stabilised common emitter amplifier. Use an NPN transistor. **[10]**

QUESTION 4

4.1 State TEN basic differences between FM and AM radio receivers. Give your answer in table form. (10)

4.2 Explain the term *filtering* with regard to radio receivers and name FOUR basic filtering circuits used in receivers. (5)
[15]

QUESTION 5

Explain interlaced scanning in detail with regard to monochrome television receivers. Use sketches to aid you with your explanation. **[15]**

QUESTION 6

State the SIX subsections that are required to be included in a colour TV receiver to produce a well-defined colour image. **[6]**

Copyright reserved

QUESTION 7

Give a short description of each of the following main subsections of an oscilloscope:

7.1 The cathode-ray tube

7.2 The vertical amplifier

7.3 The horizontal amplifier

7.4 The time-base generator

7.5 The delay line

7.6 The trigger circuit

7.7 The power supply unit

(7 × 2) **[14]**

QUESTION 8

'The level of your ability to repair electronic equipment can depend on the condition of your test equipment.'

With this statement in mind give FIVE safety guidelines for test equipment. (5 × 2) **[10]**

TOTAL: 100

Copyright reserved

RADIO AND TELEVISION THEORY N2

FORMULA SHEET

CAPACITOR CALCULATIONS

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

Capacitors in parallel $$C_T = C_1 + C_2 + ...$$

Instantaneous voltage across a capacitor

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

Initial charging current through a capacitor

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

Time constant $$\tau = R \times C$$

Charge of capacitor $$Q = C \times V$$

AC THEORY

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

Capacitive reactance $$X_C = \frac{1}{2.\pi.F.C}$$

Impedance for RL, RC and RLC circuits

$$Z = \sqrt{R^2 + {X_L}^2} : Z = \sqrt{R^2 + {X_C}^2} : Z = \sqrt{R^2 + \left(X_L \approx X_C\right)^2}$$

Circuit current for RL, RC and RLC circuits

$$I_T = \frac{V_T}{X_L}: \qquad I_T = \frac{V_T}{X_C}: \qquad I_T = \frac{V_T}{Z}$$

Voltage drop across components

$$V_R = I \times R : V_L = I \times X_L : V_C = I \times X_C$$

Copyright reserved

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

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

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

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

OHM'S LAW

Resistors in series $R_T = R_1 + R_2 + ...$

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

Voltage drop $V = I \times R$

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

OSCILLOSCOPE CALCULATIONS

Period = Time/division x horizontal divisions

Amplitude = Volts/division x vertical divisions

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

RMS voltage = 0,707 x peak

Average voltage = 0,637 x peak

Voltage (peak to peak) = 2 x peak

Series resistor $R_S = \frac{V}{I_M} - R_M$

Shunt resistor $R_{SH} = \frac{I_M \times R_M}{I - I_M}$

Copyright reserved