



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

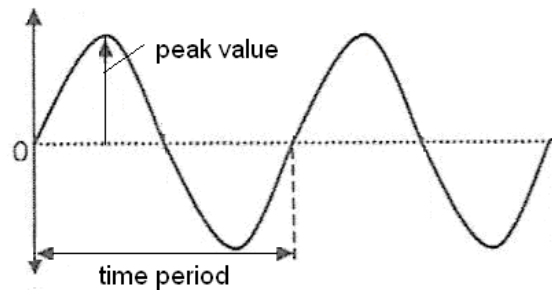
RADIO THEORY N2

1 AUGUST 2018

This marking guideline consists of 6 pages.

QUESTION 1

1.1



(4)

1.2 RMS voltage = $0,707 \times V_{\text{maximum}}$

$$V_{\text{max}} = \frac{212,1}{0,707} \checkmark = 300 \text{ V} \checkmark$$

$$\text{Average voltage} = 0,637 \times 300 \checkmark = 191,1 \text{ V} \checkmark$$

(4)

$$1.3 \quad \frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{10 \times 10^{-6}} + \frac{1}{20 \times 10^{-6}} \checkmark = \frac{3}{20 \times 10^{-6}} = 150\,000 \checkmark$$

$$C_T = 0,00000667 = 6,67 \mu\text{F} \checkmark$$

(3)

- 1.4
- Area of the plates
 - Dielectric
 - Distance between the plates

(3)

$$1.5.1 \quad f_r = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{20 \times 10^{-3} \times 68 \times 10^{-6}}} \checkmark$$

$$= 136,47 \text{ Hz} \checkmark$$

$$1.5.2 \quad X_L = 2\pi f L = 2\pi \cdot 136,47 \times 20 \times 10^{-3} \checkmark$$

$$= 17,15 \Omega \checkmark$$

$$1.5.3 \quad \bullet \quad Q = \frac{X_L}{R} = \frac{17,15}{10} \checkmark = 1,72 \checkmark$$

$$\bullet \quad Q = \frac{1}{R} \sqrt{\frac{L}{C}} \checkmark = 1,72 \checkmark$$

(Any ONE)
(3 × 2)

(6)
[20]

QUESTION 2

2.1

$$R_{SH} = \frac{I_m \times R_m}{I_T - I_m} \quad R_{SH} = \frac{1 \times 10^{-3} \div 200}{50 \times 10^{-3} - 1 \times 10^{-3}} \checkmark$$

$$R_{SH} = \frac{0,2}{49 \times 10^{-3}} \checkmark$$

$$= 4,08 \, \Omega \checkmark \quad (3)$$

- 2.2
- The correct polarity should always be observed.
 - Always select the highest range and then decrease the range.
 - Always connect a voltmeter in parallel.
 - Always take the loading effect of a voltmeter into account.
- (4)

- 2.3
- AC voltage measurements
 - DC voltage measurements
 - Studying waveforms and other time-varying quantities
 - Frequency measurements
 - Indicating the gain of an amplifier
 - Indicating the phase difference between two signals
 - Indicating distortion in waveforms
- (Any 6 × 1) (6)

2.4 2.4.1 To make the display sharp and clear

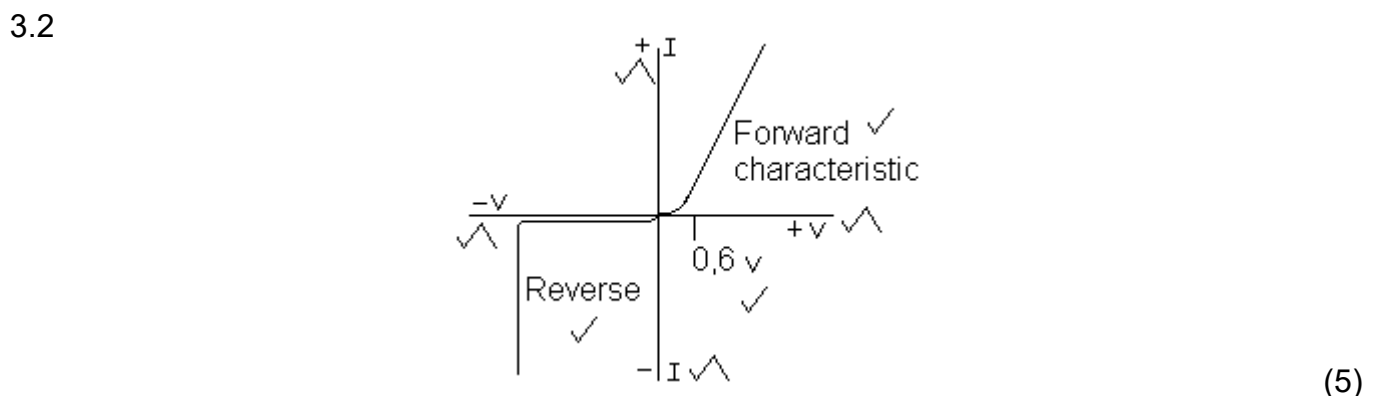
2.4.2 To control the amplitude of the display

(2 × 1) (2)

[15]

QUESTION 3

- 3.1 When the AC sine wave is positive (positive half) on the anode the diode is forward-biased and conducts current. When the AC sine wave is negative (negative half) on the anode the diode is reverse-biased and does not conduct.
- (4)



- 3.3 Varactor diode
- (1)
- [10]**

QUESTION 4

- 4.1
- Common emitter
 - Common base
 - Common collector
- (3)

- 4.2
- 
- Emitter: supplies the majority carriers
 - Collector: collects the charged carries
 - Base: controls amount of current between emitter and collector
- (4)

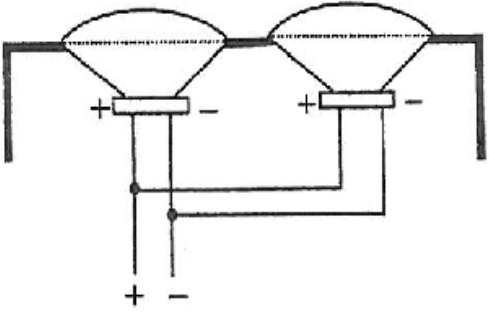
- 4.3
- Depletion type
 - Enhancement type
- (2)

- 4.4
- | | |
|-------|-------------|
| 4.4.1 | none |
| 4.4.2 | very high |
| 4.4.3 | 180 degrees |
| 4.4.4 | high |
| 4.4.5 | 0 degrees |
| 4.4.6 | high |
- (6 × 1) (6)
[15]

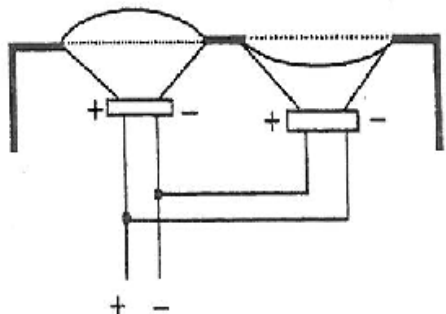
QUESTION 5

- 5.1
- Advantage: Best frequency response✓
High quality✓
Disadvantage: Very expensive✓
Requires external supply✓
- (2 + 2) (4)

- 5.2
- in phase movement



out of phase movement


- (4)

- 5.3
- A high-frequency signal is fed to the erase head by an internal oscillator which forces the magnetic particles on the tape out of alignment.
- (2)
[10]

QUESTION 6

- 6.1
- | | |
|-------|------------------|
| 6.1.1 | RF amplifier |
| 6.1.2 | Mixer |
| 6.1.3 | IF amplifier |
| 6.1.4 | Detector |
| 6.1.5 | Audio amplifier |
| 6.1.6 | Ganged tuned |
| 6.1.7 | Local oscillator |

(7 × 1) (7)

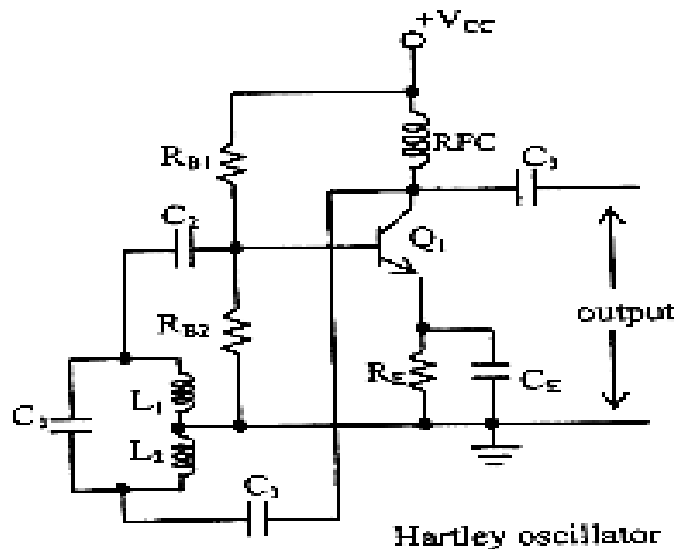
- 6.2 This circuit mixes the output of the RF amplifier with that of the oscillator.✓✓
The output is the sum and difference of the two frequencies.✓

(3)
[10]**QUESTION 7**

- 7.1
- Oscilloscope
 - Multimeter
 - Signal generator
 - Signal tracer
 - Signal injector

(Any 4 × 1) (4)

7.2

(½ mark for each component) (6)
[10]

QUESTION 8

- 8.1 False
- 8.2 True
- 8.3 False
- 8.4 True
- 8.5 False
- 8.6 False
- 8.7 True
- 8.8 True
- 8.9 False
- 8.10 True

(10 × 1) **[10]**

TOTAL: 100