



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN
NASIONALE CERTIFIKAAT
INDUSTRIËLE ELEKTRONIKA N4

28 November 2023

Hierdie nasienriglyn bestaan uit 7 bladsye.

VRAAG 1

1.1 Volgens Ohm se wet:

$$R_P = \frac{R_L R_2}{R_L + R_2} = \frac{6,5}{6 + 5} = 2,727 \Omega \checkmark \checkmark$$

$$V_P = \frac{R_P}{R_T} \times V_T = \frac{2,727}{6,727} \times 10 = 4,054 V \checkmark \quad (5)$$

$$I_{RL} = \frac{V_P}{R_L} = \frac{4,054}{6} = 0,676 A \checkmark \checkmark$$

1.2 Volgens Thevenin se stelling:

$$V_{TH} = V_{AB} = \frac{R_2}{R_T} \times V_T = \frac{5}{9} \times 10 = 5,556 V \checkmark \checkmark$$

$$R_{TH} = \frac{R_1 R_2}{R_1 + R_2} = \frac{4,5}{4 + 5} = 2,222 \Omega \checkmark \checkmark$$

$$I_{RL} = \frac{V_{TH}}{R_T} = \frac{5,556}{8,222} = 0,676 A \checkmark \checkmark \quad (6)$$

[11]

VRAAG 2

2.1 $Z_1 = 23 + j18 = 29,209 \angle 38,047$

$Z_2 = 40 - j31 = 50,606 \angle -37,776$

$Z_3 = 55 + j30 = 62,65 \angle 28,61$

$Z_S = 23 + j18 + 40 - j31 = 63 - j13 = 64,327 \angle -11,66 \checkmark$

$Z_4 = 20 - j45$

$$Z_P = \frac{Z_S \times Z_3}{Z_S + Z_3} = \frac{64,327 \angle -11,66 \times 62,65 \angle 28,61}{63 - j13 + 55 + j30} = \frac{4030,087 \angle -16,95}{118 + j17} \checkmark \checkmark \checkmark$$

$$= \frac{4030,087 \angle -16,95}{119,218 \angle 8,198} = 33,804 \angle -25,148 = 30,6 - j14,365 \checkmark \checkmark$$

$$Z_T = 30,6 - j14,365 + 20 - j45 = 50,6 - j59,365 = 78,003 \angle -49,56 \Omega \checkmark \checkmark \quad (8)$$

2.2 2.2.1 Die vermoë van 'n induktor om 'n verandering in stroom teë te staan

2.2.2 Die gehaltefaktor van 'n kring of komponent teen
resonansiefrekwensie
OFDie verhouding van die reaktansie van die induktor of kapasitor tot
die ekwivalente weerstand daarvan

2.2.3 Die fasorsom van die reaktansies en die weerstand

2.2.4 Die hoek tussen die toegepaste spanning en die kringstroom

2.2.5 Wanneer die reaktansies X_L en X_C gelyk is

(5 × 1) (5)

2.3 2.3.1

$$X_L = X_C$$

$$2\pi fL = \frac{1}{2\pi fC}$$

$$\therefore C = \frac{1}{4\pi^2 f^2 L} \checkmark$$

$$= \frac{1}{4 \times \pi^2 \times 50^2 \times 0,127} \checkmark$$

$$= 79,780 \mu F \checkmark$$

(3)

2.3.2 Teen resonansie: $Z = R$

$$\therefore I = \frac{V}{R} = \frac{250}{250} = 1A \checkmark$$

$$\text{Nou } X_L = 2\pi fL = 2 \times \pi \times 50 \times 0,127 = 39,898 \Omega$$

$$\therefore V_C = V_L = IX_L = 1 \times 39,898 = 39,898 V \checkmark$$

(2)

[18]

VRAAG 3

3.1 3.1.1 Die positiewe kant trek elektrone van die N-tipe materiaal aan en die negatiewe kant trek gate van die P-tipe materiaal aan.

3.1.2 Deur termiese of ander metodes gegenereer en tree ook as ladingsdraers op; staan ook as minderheidladingsdraers bekend

(2 × 2) (4)

3.2 3.2.1 B
3.2.2 B
3.2.3 A
3.2.4 D
3.2.5 C

(5 × 1) (5)

[9]

VRAAG 4

- 4.1 4.1.1 Waar
 4.1.2 Onwaar
 4.1.3 Waar
 4.1.4 Onwaar
 4.1.5 Waar

(5 × 1) (5)

4.2 4.2.1 $V_{GS} = V_m - \frac{I_{GS}}{2fc} = 17 - \frac{20 \times 10^{-3}}{2 \times 50 \times 35 \times 10^{-6}} = 11,286 \text{ V}$

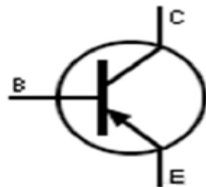
4.2.2 $V_{r(WGK)} = \frac{I_{GS}}{2 \times \sqrt{3} \times f \times C} = \frac{20 \times 10^{-3}}{2 \times \sqrt{3} \times 50 \times 35 \times 10^{-6}} = 3,333 \text{ V}$

4.2.3 $\%r = \frac{V_{r(WGK)}}{V_{DC}} \times 100 = \frac{3,333}{11,286} \times 100 = 29,51\%$

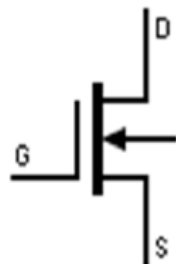
(3 × 2) (6)
[11]**VRAAG 5**

- 5.1 Deur 'n klein meevoorspanning op die basis van die transistors toe te pas (1)

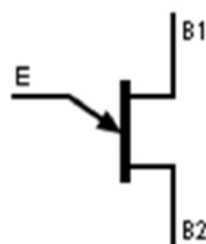
- 5.2 5.2.1



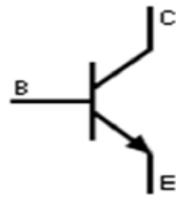
- 5.2.2



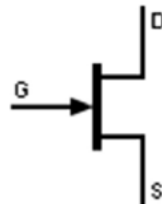
- 5.2.3



5.2.4



5.2.5



(5 × 1) (5)

5.3 5.3.1

$$\begin{aligned} A_p &= 10 \log \frac{P_{\text{uit}}}{P_{\text{in}}} \\ &= 10 \log \frac{500}{500 \times 10^{-3}} \checkmark \\ &= 30 \text{ dB} \checkmark \end{aligned}$$

(2)

5.3.2

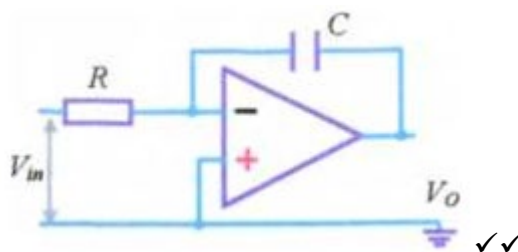
$$\begin{aligned} A_v &= 20 \log \frac{V_{\text{uit}}}{V_{\text{in}}} \quad \text{maar} \quad V_o = \sqrt{P_o R_o} \\ &= 20 \log \frac{70,717}{10} \checkmark \\ &= 16,99 \text{ dB} \checkmark \end{aligned}$$

$$\begin{aligned} &= \sqrt{500 \times 10} \checkmark \\ &= 70,717 \checkmark \end{aligned}$$

(4)
[12]

VRAAG 6

6.1



(2)

6.2 Om die wins van die versterker na die vereiste vlak te verlaag

(1)

6.3 $V_o = \left(1 + \frac{R_f}{R_{in}}\right) V_{in} \checkmark = \left(1 + \frac{15 \times 10^3}{1,2 \times 10^3}\right) \times 4 \checkmark = 54 \text{ V} \checkmark$

(3)
[06]

VRAAG 7

- 7.1 Verwysing →

Snellerkri ng✓	SBG ✓
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Las✓

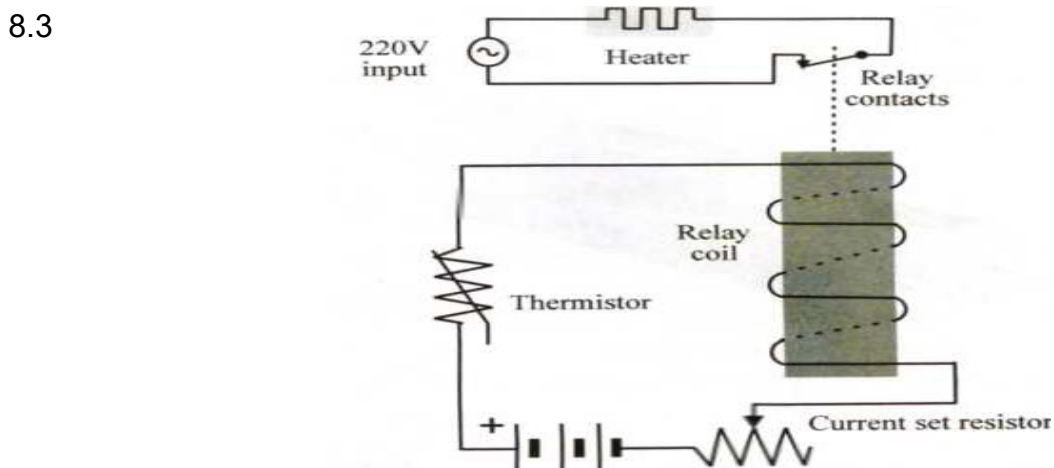
 →

Vertooneenh eid✓

 (4)
- 7.2
- Wanneer die kern in die middel van L1 en L2 is, sal die geïnduseerde spanning in die sekondêre spoel nul wees en daar sal geen uitset wees nie.
 - Wanneer die kern óf op óf af beweeg, sal daar meer geïnduseerde spanning in daardie sekondêre spoel wees.
 - Die grootte van die uitsetspanning is in verhouding met die kernverplasing.
- (3)
- 7.3 Dit laat slegs positiewe pulse na die hek van 'n SBG toe en verhoed dat negatiewe pulse na die hek gaan. (2)
[9]

VRAAG 8

- 8.1
- Die oppervlakte van die plate
 - Die afstand tussen die plate
 - Die isoleermateriaal tussen die plate
- (3)
- 8.2 8.2.1 Motorvoertuie se tagometerstelsel
8.2.2 Flikkerligte (2 × 1) (2)



✓✓✓✓✓

(5)
[10]

VRAAG 9

- 9.1 Dit veroorsaak dat die beeld oor die skerm sweef, wat meting bemoeilik (2)
- 9.2 A – Verwarmer
B – Beheerrooster
C – Versnelanode
D – Omsitstraal
E – Divergeerstraal (5)
- 9.3 • Tydreëlkring vir elektroniese toepassings
• Generering van oudiofrekwensie
• Skandeerkringe in 'n ossilloskoop (3)
- 9.4 9.4.1 $V_P = 2,9 \times 0,6 = 1,74 \text{ V} \checkmark \checkmark$
- 9.4.2 $V_{wgk} = 0,707 \times 1,74 = 1,23 \text{ V} \checkmark$
 $V_{gem} = 0,637 \times 1,74 = 1,108 \text{ V} \checkmark$
- (2 × 2) (4)
[14]
- TOTAAL: 100**