



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

INDUSTRIËLE ELEKTRONIKA N3

29 Julie 2024

Hierdie nasienriglyn bestaan uit 9 bladsye.

AFDELING A

VRAAG 1

1.1	1.1.1	C	(5 × 1)	(5)
	1.1.2	B		
	1.1.3	A		
	1.1.4	A		
	1.1.5	C		
1.2	1.2.1	Waar	(5 × 1)	(5)
	1.2.2	Onwaar		
	1.2.3	Onwaar		
	1.2.4	Waar		
	1.2.5	Onwaar		
1.3	1.3.1	Donortoering	(5 × 1)	(5)
	1.3.2	Diode		
	1.3.3	MOHVET		
	1.3.4	Lyn		
	1.3.5	Verlaag		
1.4	1.4.1	I	(5 × 1)	(5)
	1.4.2	J		
	1.4.3	G		
	1.4.4	E		
	1.4.5	F		
				[20]
TOTAAL AFDELING A:				20

AFDELING B

VRAAG 2

- 2.1 2.1.1 Lus BAFEB:
 $V_T = V_{R1} + V_{R7} + V_{R6} + V_{R2}$
 $12 = (6 + 7 + 6) \cdot I_1 + 8(I_1 + I_2) \checkmark$ OF $12 = 19I_1 + 8I_1 + 8I_2$
 $12 = 27I_1 + 8I_2 \checkmark$ (1) (2)
- 2.1.2 Lus BCDEB:
 $V_T = V_{R3} + V_{R4} + V_{R5} + V_{R2}$
 $12 = (12 + 5 + 5) \cdot I_2 + 8(I_1 + I_2) \checkmark$ OF $12 = 22I_2 + 8I_1 + 8I_2$
 $12 = 8I_1 + 30I_2 \checkmark$ (2) (2)
- 2.1.3 (1) $\times$ 8:
 $96 = 216I_1 + 64I_2$ (3) $\checkmark$
(2) $\times$ 27:
 $324 = 216I_1 + 810I_2$ (4) $\checkmark$
(4) $-$ (3):
 $324 = 216I_1 + 810I_2$ (4)
 $96 = 216I_1 + 64I_2$ (3)
 $228 = 746I_2 \checkmark$
 $I_2 = \frac{228}{746}$
 $I_2 = 0,306A \checkmark$
Vervang I_2 in (1):
 $12 = 27I_1 + 8I_2$
 $12 = 27I_1 + 8(0,306) \checkmark$
 $12 = 27I_1 + 2,448$
 $27I_1 = 12 - 2,448$
 $27I_1 = 9,552$
 $I_1 = \frac{9,552}{27}$
 $I_1 = 0,354A \checkmark$ (6)
- 2.2 2.2.1 $I_T = \sqrt{I_R^2 + (I_L - I_C)^2}$
 $I_T = \sqrt{0,5^2 + (3,5 - 3,15)^2} \checkmark$
 $I_T = 0,610A \checkmark$ (2)

$$\begin{aligned}
 2.2.2 \quad \cos \theta &= \frac{I_R}{I_T} \\
 \cos \theta &= \frac{0,5}{0,61} \checkmark \\
 \theta &= \cos^{-1} \frac{0,5}{0,61} \\
 \theta &= 34,948^\circ \checkmark
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 2.2.3 \quad R &= \frac{V}{I} \\
 R &= \frac{750}{0,5} \\
 R &= 1,5k\Omega \checkmark
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 2.2.4 \quad X_L &= \frac{V}{I_L} \\
 X_L &= \frac{750}{3,5} \\
 X_L &= 214,286\Omega \checkmark \\
 X_L &= 2\pi \cdot f \cdot L \\
 L &= \frac{X_L}{2\pi \cdot f} \\
 L &= \frac{214,286}{2\pi \cdot 6 \times 10^6} \checkmark \\
 L &= 5,864\mu H \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.2.5 \quad X_C &= \frac{V}{I_C} \\
 X_C &= \frac{750}{3,15} \\
 X_C &= 238,095\Omega \checkmark \\
 X_C &= \frac{1}{2\pi \cdot f \cdot C} \\
 C &= \frac{1}{2\pi \cdot f \cdot X_C} \\
 C &= \frac{1}{2\pi \cdot (6 \times 10^6) \cdot 238,095} \checkmark \\
 C &= 111,409pF \checkmark
 \end{aligned}$$

VRAAG 3

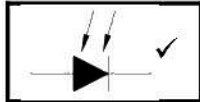
- 3.1
- Hoe langer die lengte van die geleier, hoe hoër die weerstand;✓ hoe korter die geleier, hoe laer die weerstand.✓
 - Hoe groter die deursneeoppervlakte van die geleier, hoe laer die weerstand;✓ hoe kleiner die deursneeoppervlakte, hoe hoër die weerstand.✓

(2 × 2)

(Sien na goeë dinge na)

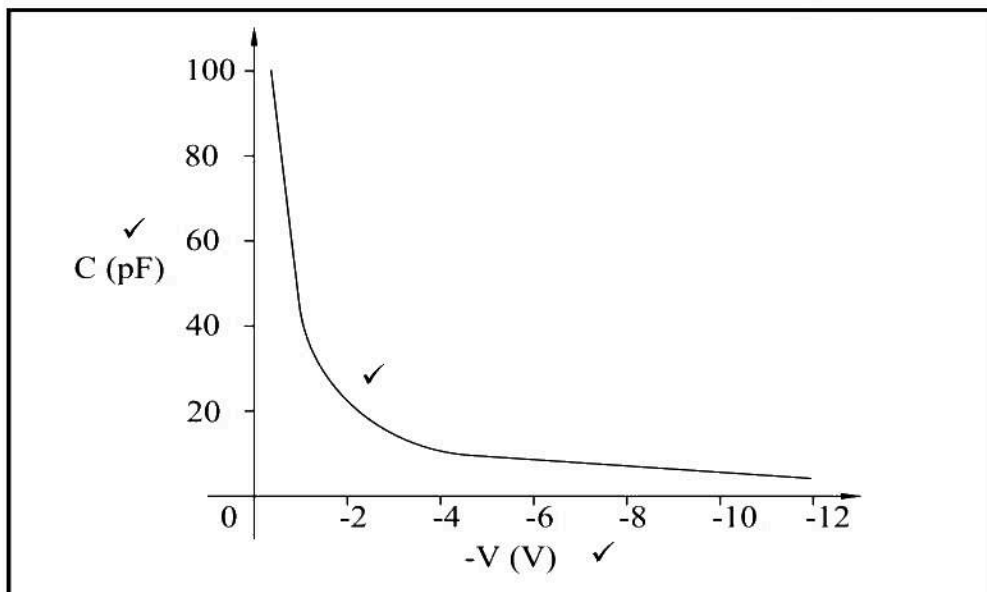
(4)

3.2 3.2.1



(1)

3.2.2



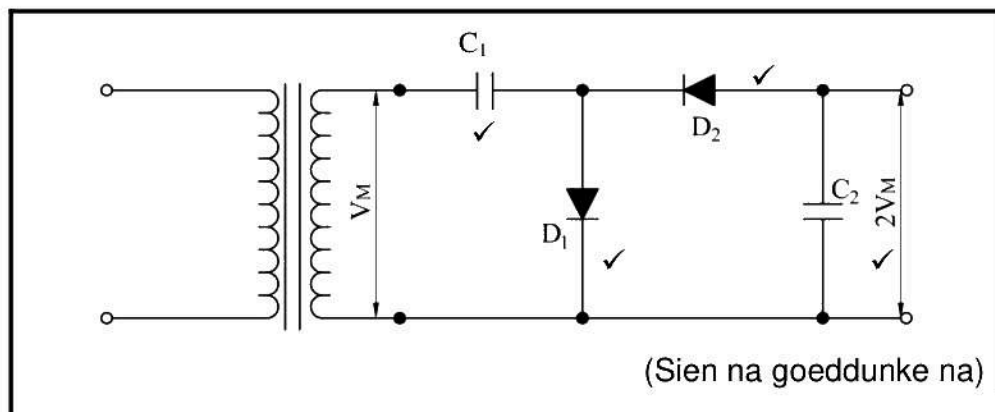
(3)

- 3.3
- Fisiese hoeveelheid wat gemeet moet word
 - Akkuraatheid vereis
 - Geskikste herleidingsbeginsels
 - Werkbestek
 - Akkuraatheid
 - Sensitiwiteit
 - Stabiliteit en betroubaarheid

(Enige 3 × 1)

(3)

3.4 3.4.1

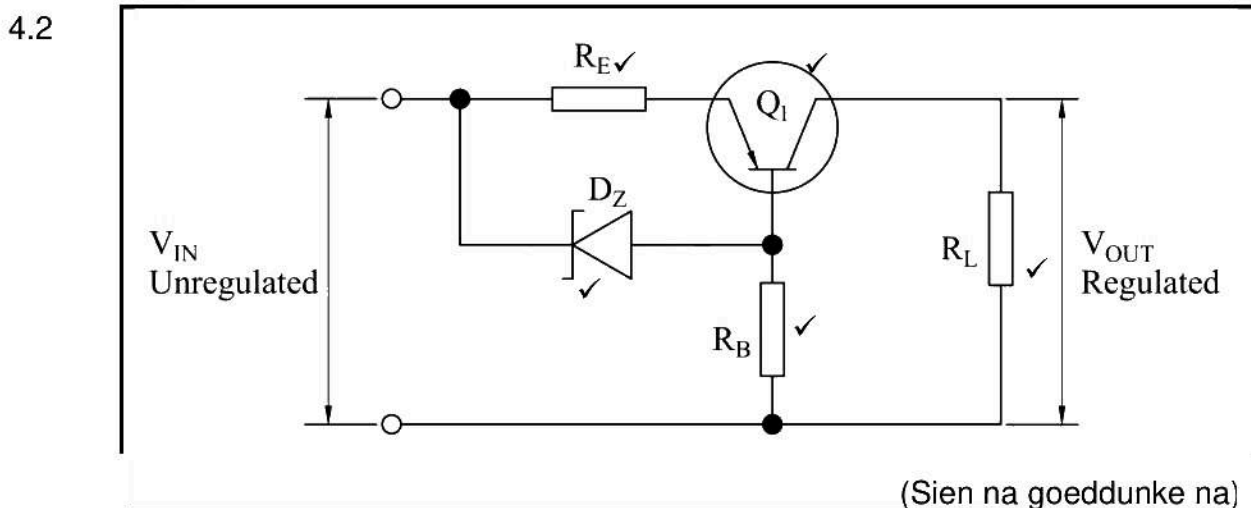
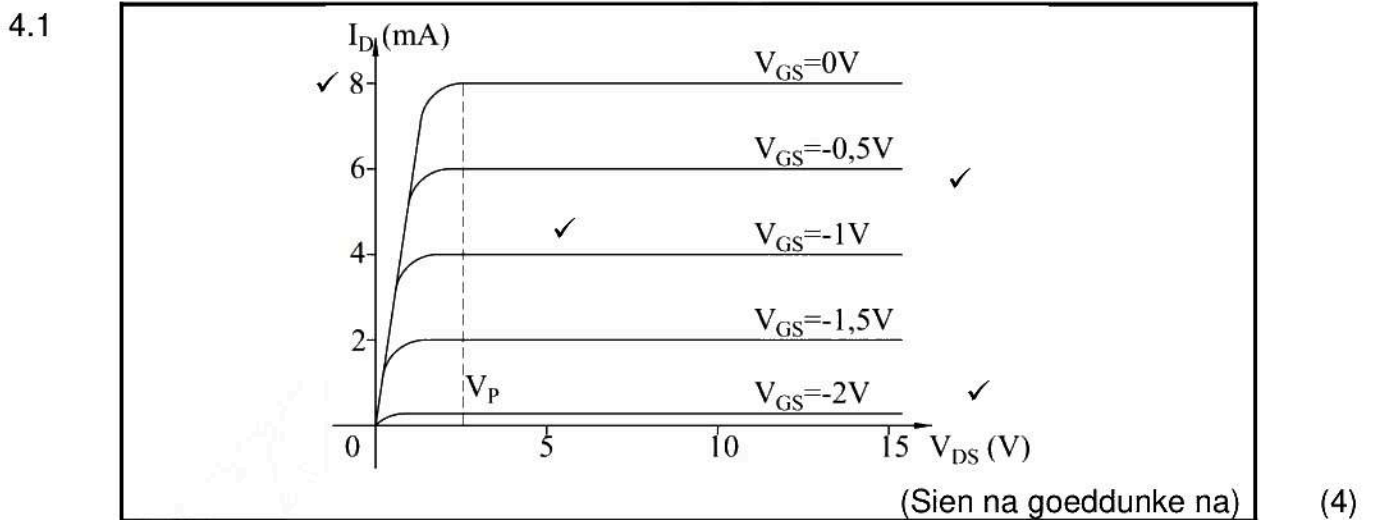


- 3.4.2
- Tydens die positiewe halfsikus is D_1 in meevoorspanning en D_2 in teenvoorspanning, wat kapasitor C_1 tot spitsspanning V_M laai.✓
 - Tydens die negatiewe halfsikus is D_2 in meevoorspanning en D_1 in teenvoorspanning, wat kapasitor C_2 tot twee keer die spitsspanning $2 V_M$ laai.✓ (Sien na goeëddunke na) (2)

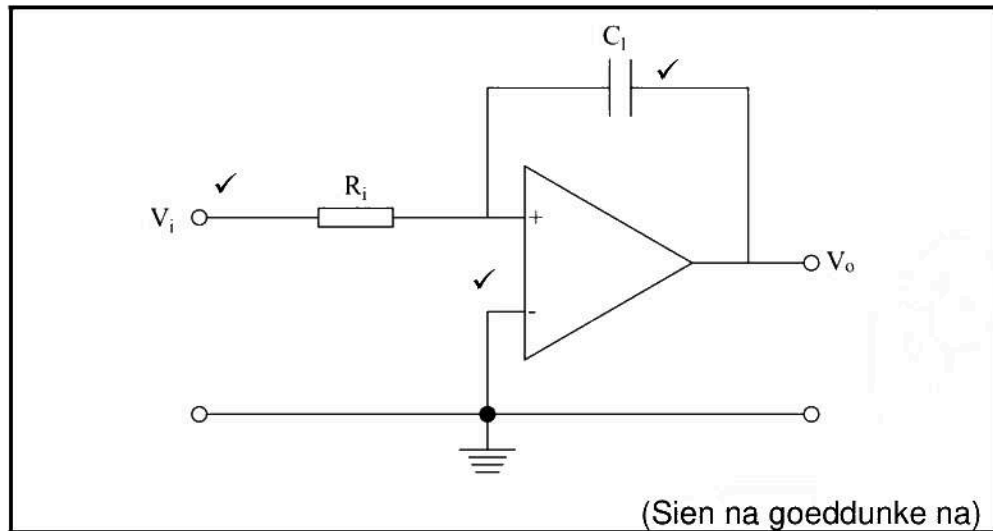
- 3.5
- Wanneer trivalente atome soos boor by suiwer silikon of germanium gevoeg word, vorm hulle kovalente bindings met mekaar.✓
 - Een van die silikon-/germaniumatome bly sonder 'n kovalente binding en skep 'n afwesigheid van 'n elektron ('n gat).✓
 - Hierdie gate is geneig om elektrone aan te trek. Hierdie trivalente atome staan ook as akseptoratome bekend.✓ (Sien na goeëddunke na) (3)

- 3.6 Spanning word gegenereer sodra 'n invalslig op die PN-aansluiting val. (1)
[21]

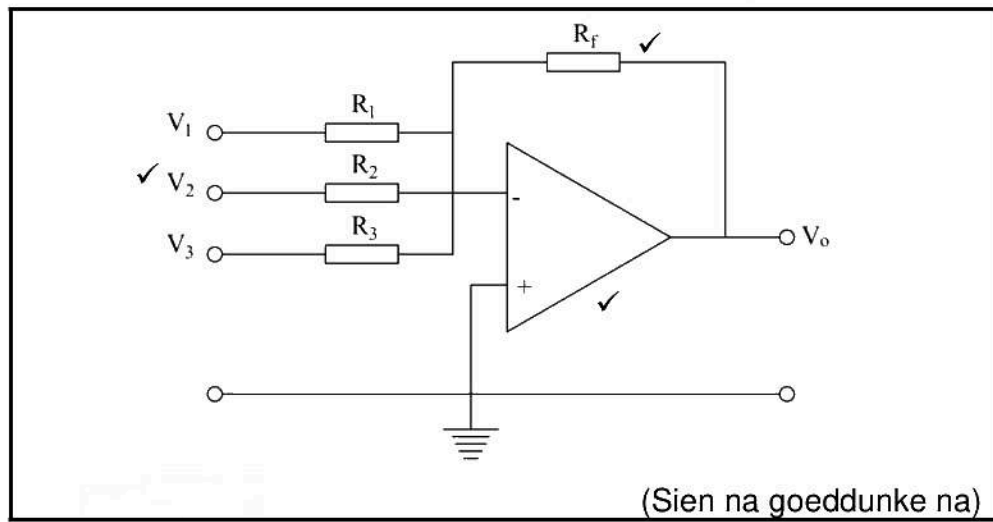
VRAAG 4



4.3 4.3.1



4.3.2



(2 × 3)

(6)

4.4 4.4.1 $V_{CC} = V_{CE} = 20V$ ✓

(1)

4.4.2

$$R_C = \frac{V_{CC}}{I_C}$$

$$R_C = \frac{12}{6,5 \times 10^{-3}} \quad \checkmark$$

$$R_C = 1,846 k\Omega \quad \checkmark$$

(2)

4.4.3

$$R_B = \frac{V_{BE}}{I_B}$$

$$R_B = \frac{0,7}{40 \times 10^{-6}} \quad \checkmark$$

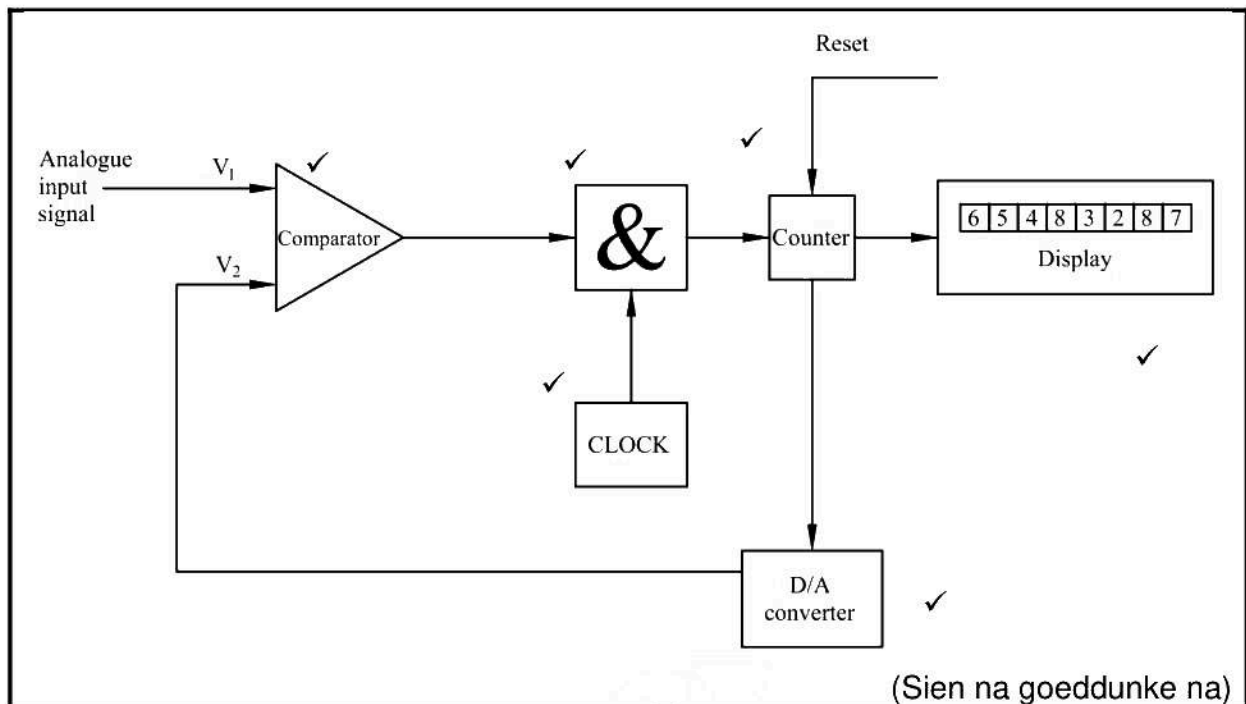
$$R_B = 17,5 k\Omega \quad \checkmark$$

(2)

[20]

VRAAG 5

5.1



5.2

5.2.1

Die houstroom is die minimum stroom ✓ wat benodig word om die silikonbeheerde gelykrichter in die geleidende toestand te hou. ✓

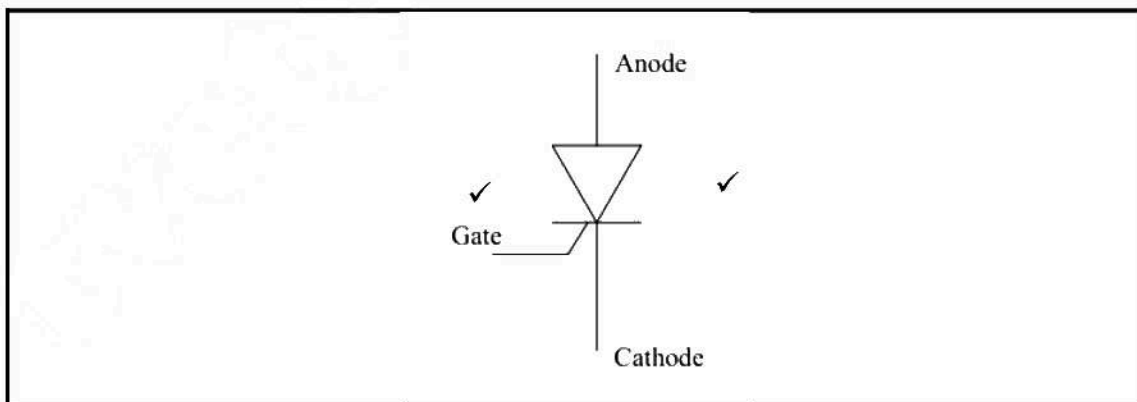
(2)

5.2.2

Die vertragsingshoek is die tyd wat die silikonbeheerde gelykrichter af/vertraag is ✓ voordat dit begin gelei. ✓

(2)

5.3



(1 punt vir diagram, 1 punt vir byskrifte)

(2)

5.4

5.4.1

$$V_{RMS} = \frac{V_{P-P}}{2} \times 0,707$$

$$V_{RMS} = \frac{(4 \times 50 \times 10^{-3})}{2} \times 0,707 \quad \checkmark$$

$$V_{RMS} = 70,7mV \quad \checkmark$$

5.4.2

$$V_{AVE} = \frac{V_{P-P}}{2} \times 0,637$$

$$V_{AVE} = \frac{4 \times 50 \times 10^{-3}}{2} \times 0,637 \quad \checkmark$$

$$V_{AVE} = 63,7mV \quad \checkmark$$

5.4.3

$$f = \frac{1}{t}$$

$$f = \frac{1}{(5 \times 20 \times 10^{-3})} \quad \checkmark$$

$$f = 10Hz \quad \checkmark$$

(3 × 2)

(6)

[18]

TOTAAL AFDELING B:

80

GROOTTOTAAL:

100