



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

ELEKTROTEGNOLOGIE N3

10 Desember 2025

Hierdie nasienriglyn bestaan uit 7 bladsye.

VRAAG 1

- 1.1 Motor✓
- 1.2 Kommutator✓
- 1.3 Poolskoene✓
- 1.4 Luswikkelings✓
- 1.5 Golfwikkelings✓
- 1.6 Rotor✓
- 1.7 Werwelstroomverlies✓
- 1.8 Rollaer✓
- 1.9 Soldeerwerk✓
- 1.10 Wringkrag✓

(10 × 1) [10]

VRAAG 2

- 2.1
- Die sterkte van die magnetiese veld of die magnetiese vloeddigtheid✓
 - Die tempo waarteen die vloed deur die bewegende geleier gesny word✓
 - Die aantal aktiewe geleiers wat in serie gekoppel is✓
 - Die aantal pare pole wat gebruik is✓

(4)

- 2.2
- Draaibanke✓
 - Drukwerkmasjiene✓
 - Houtwerkmasjiene✓
 - Boormasjiene✓
 - Freemasjiene✓
 - Sentrifugale pompe✓

(Enige 2 × 1) (2)

- 2.3
- $$I_{sh} = \frac{V}{R_{sh}} = \frac{400}{120} = 3,333 \text{ A} \checkmark$$
- $$I_a = I_L - I_{sh} = 30 - 3,333$$
- $$= 26,667 \text{ A} \checkmark$$
- $$E = V - I_a R_a$$
- $$E = 400 - (26,667)(0,35) \checkmark$$
- $$= 390,667 \text{ V} \checkmark$$

(4)

[10]

VRAAG 3

- 3.1
- Luswikkeling✓
 - Golfwikkeling✓
- (2)
- 3.2 Dit word as 'n bekragter aan GS-transmissielyne gebruik✓
- (1)
- 3.3 3.3.1
$$E = \frac{2p\phi ZN}{60c}$$
$$= \frac{2(3)(25 \times 10^{-3})(600)(700)}{60(2)} \checkmark \checkmark$$
$$= 525 \text{ V } \checkmark$$
- (3)
- 3.3.2
$$E = V + I_a R_a$$
$$V = E - I_a R_a$$
$$= 525 - (100)(0,3) \checkmark$$
$$= 495 \text{ V } \checkmark$$
- (2)
- 3.3.3 Conductors per slot = $\frac{\text{Total number of conductors}}{\text{number of slots}} = \frac{600}{80} \checkmark$
= 7,5 or 8 cond/slots ✓
- (2)
- [10]**

VRAAG 4

- 4.1
- Laerwrywing✓
 - Borselwrywing✓
- (2)
- 4.2
- Ankerkern✓
 - Poolskoene✓
 - Veldpole✓
- (3)
- 4.3 4.3.1
$$P_o = VI_L$$
$$I_L = \frac{P_o}{V} = \frac{60 \times 10^3}{500} \checkmark$$
$$= 120 \text{ A } \checkmark$$
- (2)

4.3.2

$$\eta = \sqrt{\frac{I_1}{I_1 + I_2}} \times 100\%$$

$$92 = \sqrt{\frac{120}{120 + I_2}} \times 100\% \checkmark$$

$$0,92 = \sqrt{\frac{120}{120 + I_2}}$$

$$(0,92)^2 = 0,846 = \frac{120}{120 + I_2} \checkmark$$

$$0,846(120 + I_2) = 120$$

$$\therefore I_2 = 21,844 \text{ A} \checkmark$$

(3)
[10]

VRAAG 5

5.1 Die tyd wat dit enige sinusgolf neem om een siklus in een sekonde te voltooi ✓✓ (2)

5.2 5.2.1 $\omega = 2\pi f = 942,478$
 $f = \frac{942,478}{2\pi} \checkmark$
 $= 150 \text{ Hz} \checkmark$ (2)

5.2.2 $T = \frac{1}{f} = \frac{1}{150} = 0,007 \text{ sec or } 6,667 \text{ ms}$ (1)

5.2.3 $i = 35 \sin (942,478t)$
 $= 35 \sin (942,478 \times 0,8 \times 10^{-3} \times 57,3^\circ) \checkmark$
 $= 23,961 \text{ A} \checkmark$ (2)

5.2.4 $i = 35 \sin (942,478 \times t \times 57,3^\circ)$
 $12,5 = 35 \sin (942,478 \times t \times 57,3^\circ) \checkmark$
 $\therefore \sin (942,478 \times t \times 57,3^\circ) = \frac{12,5}{35} = 0,357$
 $t = \frac{\sin^{-1}(0,357)}{(942,478 \times 57,3^\circ)} \checkmark$
 $= 0,000387 \text{ sec or } 0,387 \text{ ms} \checkmark$ (3)

[10]

VRAAG 6

6.1 6.1.1 Die stroom is in fase met die spanning. ✓✓ (2)

6.1.2 Die stroom loop die spanning met 90° na. ✓✓

6.1.3 Die stroom lei die spanning met 90° . ✓✓ (2)

6.2 6.2.1
$$F_R = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{(400 \times 10^{-3})(17,59 \times 10^{-6})}} \checkmark$$

$$= 60,001 \text{ Hz or } 60 \text{ Hz } \checkmark$$
 (2)

6.2.2
$$Z_D = \frac{L}{CR} = \frac{400 \times 10^{-3}}{(17,59 \times 10^{-6})(50)} \checkmark$$

$$= 454,804 \Omega \checkmark$$
 (2)
[10]

VRAAG 7

7.1
$$V_L = \sqrt{3}V_P$$

$$V_P = \frac{V_L}{\sqrt{3}} = \frac{350}{\sqrt{3}} \checkmark$$

$$= 202,073 \text{ V } \checkmark$$
 (2)

7.2
$$P = \sqrt{3}V_L I_L \cos \theta \times \eta$$

$$I_L = \frac{P}{\sqrt{3}V_L \cos \theta \times \eta} = \frac{120 \times 10^3}{\sqrt{3}(350)(0,9)(0,92)} \checkmark$$

$$= 239,068 \text{ A } \checkmark$$

$$I_P = I_L = 239,068 \text{ A } \checkmark$$
 (3)

Metode 2

$$P_{IN} = \frac{P_O}{\eta}$$

$$= \frac{120 \times 10^3}{0,92}$$

$$= 130.434 \text{ KW } \checkmark$$

$$I_P = I_L = \frac{P_{IN}}{\sqrt{3}V_L \cos \phi}$$

$$= \frac{130.434 \times 10^3}{\sqrt{3} \times 350 \times 0,9} \checkmark$$

$$= 239,068 \text{ A } \checkmark$$

7.3
$$\text{kVA} = \frac{\sqrt{3}V_L I_L}{1\,000}$$

$$= \frac{\sqrt{3} \times 350 \times 239,068}{1\,000} \checkmark$$

$$= 144,927 \text{ kVA or } 144927,273 \text{ VA } \checkmark$$

7.4 $\text{pf} = \cos \theta = 0,9$
 $\therefore \theta = \cos^{-1}(0,9) = 25,842^\circ \checkmark$
 $Q = \sqrt{3} V_L I_L \sin \theta = \sqrt{3}(350)(239,068)(\sin 25,842^\circ) \checkmark$
 $= 63,172 \text{ kVA}_r \text{ or } 63172,487 \text{ VA}_r \checkmark$ (3)
[10]

VRAAG 8

- 8.1
- Ster-ster✓
 - Ster-delta✓
 - Delta-delta✓
 - Delta-ster✓
- (4)

8.2 8.2.1 $\frac{V_1}{V_2} = \frac{N_1}{N_2}$
 $V_2 = \frac{V_1 \times N_2}{N_1} = \frac{(2100)(1)}{10} \checkmark$
 $= 210 \text{ V} \checkmark$ (2)

8.2.2 $\frac{I_2}{I_1} = \frac{N_1}{N_2}$ **OF** $\frac{V_1}{V_2} = \frac{I_2}{I_1}$
 $I_1 = \frac{I_2 \times N_2}{N_1} = \frac{(25)(1)}{10} \checkmark$ $I_1 = \frac{I_2 \times V_2}{V_1} = \frac{(25)(210)}{2100} \checkmark$
 $= 2,5 \text{ A} \checkmark$ $= 2,5 \text{ A} \checkmark$ (2)

8.2.3 $S = \frac{V_1 I_1}{1000} = \frac{(2100)(2,5)}{1000} \checkmark$
 $= 5,25 \text{ kVA or } 5250 \text{ VA} \checkmark$
OF
 $S = \frac{V_2 I_2}{1000} = \frac{(210)(25)}{1000} \checkmark$
 $= 5,25 \text{ kVA or } 5250 \text{ VA} \checkmark$ (2)
[10]

VRAAG 9

- 9.1
- Ongelyke skaal✓
 - Wyser/Naald✓
 - Teengewig✓
 - Veer✓
- (4)
- 9.2
- Redelik goedkoop✓
 - Sterk konstruksie✓
- (2)

9.3 9.3.1 $V_m = I_m R_m = (25 \times 10^{-3})(50) = 1,25 \text{ V} \checkmark$ (1)

9.3.2 $I_{sh} = I - I_m = 1 - (25 \times 10^{-3}) = 0,975 \text{ A} \checkmark$ (1)

9.3.3 $R_{sh} = \frac{I_m V_m}{I_{sh}} = \frac{1,25}{0,975} \checkmark$
 $= 1,282 \Omega \checkmark$ (2)
[10]

VRAAG 10

- 10.1 • Motorspoedbeheer✓
 • Tydvertragskringe✓
 • Batterylaaiers✓
 • Statiese skakelaars✓
 • Verwarmerbeheerders✓
 • Oordragbeheerders✓
 • Fasebeheerders✓
 • Gereguleerde kragbronne✓ (Enige 4 × 1) (4)

10.2 100010
 (-) $\frac{11101}{0101} \checkmark \checkmark \checkmark \checkmark$ (1 punt vir elke korrekte syfer vanaf die regterkant)

$\therefore 101_2 = (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) \checkmark$
 $= 5 \checkmark$ (6)
[10]

TOTAAL: 100