higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

ANKERWIKKELTEORIE N2

1 Desember 2023

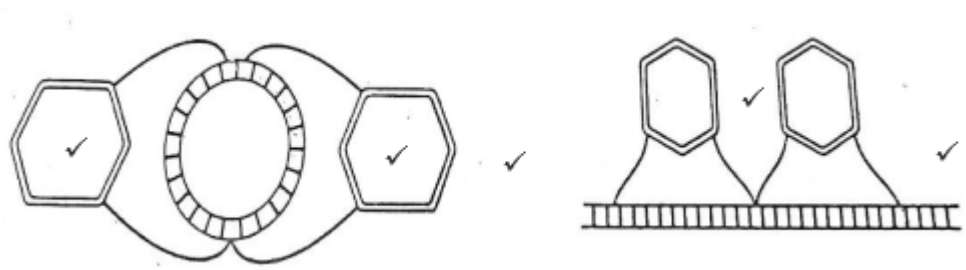
Hierdie nasienriglyn bestaan uit 7 bladsye.

Kopiereg voorbehou

VRAAG 1

1.1
- Gebruik hulppoolspoele.
- Skuif die borsels.
- Gebruik kompensasiewikkelings. (3)

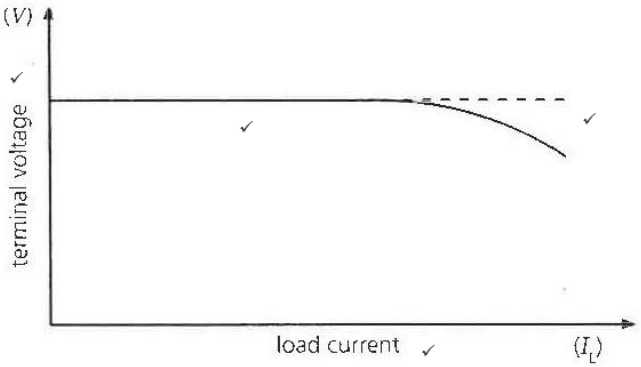
1.2



(5)

1.3
- Serie
- Omtak
- Lang omtak
- Kort omtak (4)

1.4



(4)

1.5 1.5.1
$$\text{Coil span} = \frac{\text{Total number of slots} + 1}{\text{Total number of poles}}$$

$$= \frac{72 + 1}{6} \checkmark$$

$$= 12{,}167$$

$$= 12 \checkmark$$

1.5.2
$$\text{Commutator pitch} = \frac{\text{Number of segments} + 1}{\text{Pair of poles}}$$

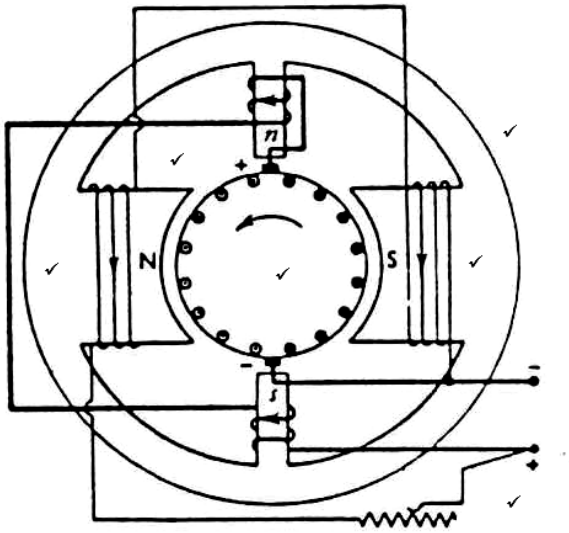
$$= \frac{143 + 1}{3} \checkmark$$

$$= 48 \checkmark$$

(2 × 2) (4)
[20]

VRAAG 2

2.1



(6)

2.2
- Met gleufvoerings wat oor die spoele in 'n gleuf gepas word
- Gleuwe bly oop, maar word daarna met strook-isolators bedek
- Gleuf met wîe toegemaak en die isolator gelyk afgesny (3)

2.3 2.3.1

$$Z = \frac{60EC}{2PN\emptyset}$$

$$Z = \frac{60 \times 450 \times 8}{2 \times 4 \times 200 \times 0{,}444}\checkmark$$

$$Z = 304{,}054\ geleiers\checkmark$$

$$\therefore Geleiers\ per\ gleuf = \frac{304{,}054}{76} = 4\ \ geleiers\ per\ gleuf\checkmark\checkmark$$

(4)

2.3.2

$$T = \frac{2PI\emptyset}{C\pi}\checkmark$$

$$T = \frac{2 \times 3 \times 110 \times 0{,}444}{6 \times \pi}$$

$$T = 15{,}546\ \text{Nm}\checkmark\checkmark$$

(3)

2.4 2.4.1

$$E = V + IR$$
$$= 220 + (1{,}8 \times 10)\checkmark$$
$$= 238\ \text{V}\checkmark$$

2.4.2

$$E = V - IR$$
$$= 220 - (1{,}8 \times 10)\checkmark$$
$$= 202\ \text{V}\checkmark$$

(2 × 2) (4)

[20]

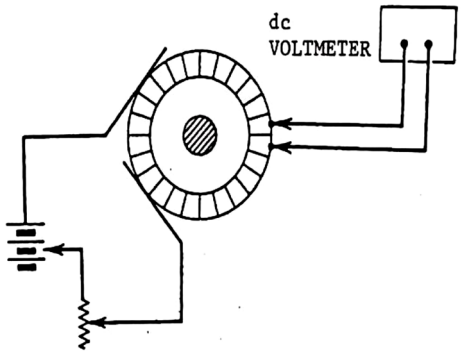
VRAAG 3

3.1
- Dit moet aardvry wees.
- Die koppelings aan die kommutator moet korrek wees.
- Daar moenie kortsluiting tussen enige wikkelings in 'n spoel wees nie.
- Daar moenie enige kortsluitings aan die spoele wees nie.
- Die laste aan die kommutator moet gaaf wees. (5)

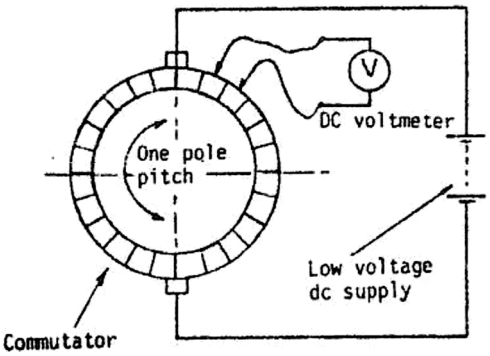
3.2
- Isolasieweerstand tot aard
- Ductor-toets (laespanningsweerstandtoets)
- Spanningsvaltoets
- Growler-toets (4)

3.3
- Los konneksies aan die velde of ankerkring
- Vuil of verstopte kommutator
- Verkeerde borsels of die verkeerde borselgraad (3)

3.4

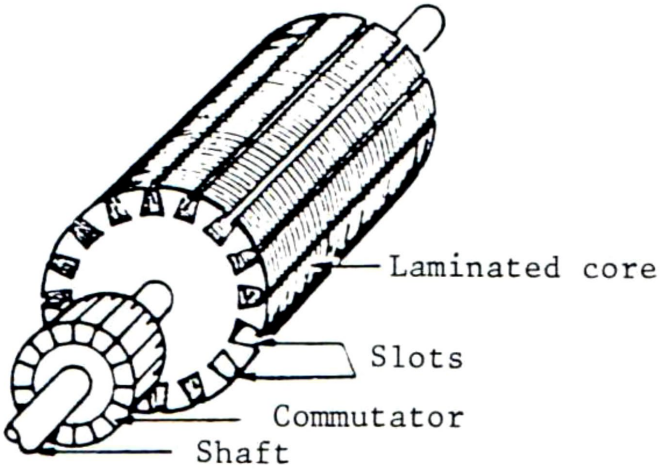


OF



(Volpunte vir enige korrekte diagram) (5)

3.5



(Volpunte vir enige korrekte diagram) (3)

[20]

VRAAG 4

4.1 4.1.1

$$X_L = 2\pi fL$$
$$X_L = 2\pi \times 50 \times 0{,}2 \checkmark$$
$$X_L = 62{,}832\ \Omega \checkmark$$

$$X_C = \frac{1}{2\pi fC}$$
$$= \frac{1}{2\pi \times 50 \times 100 \times 10^{-6}} \checkmark$$
$$= 31{,}831\ \Omega \checkmark$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$
$$Z = \sqrt{20^2 + (62{,}832 - 31{,}831)^2} \checkmark$$
$$Z = 36{,}893\ \Omega \checkmark \quad (6)$$

4.1.2

$$I_T = \frac{V_T}{Z}$$
$$= \frac{220}{36{,}893} \checkmark$$
$$= 5{,}963\ \text{A} \checkmark \quad (2)$$

4.1.3

$$V_L = I_T X_L$$
$$= 5{,}963 \times 62{,}832 \checkmark$$
$$= 374{,}667\ \text{V} \checkmark \quad (2)$$

4.1.4

$$V_C = I_T X_C$$
$$= 5{,}963 \times 31{,}831 \checkmark$$
$$= 189{,}808\ \text{V} \checkmark \quad (2)$$

4.1.5

$$\cos\theta = \frac{R}{Z} = \frac{20}{36{,}893} = 0{,}542 \checkmark$$
$$= \cos^{-1} 0{,}542 = 57{,}173° \checkmark \quad \textbf{OF} \quad \theta = 57{,}180° \quad (2)$$

4.2
- Kooiankerrotor✓
- Bewikkelde rotor✓ (2)

4.3 Die doel is om die aansitwikkeling te ontkoppel en die loopwikkeling aan te skakel sodra die motor 75% van die nominale spoed bereik.✓✓ (2)

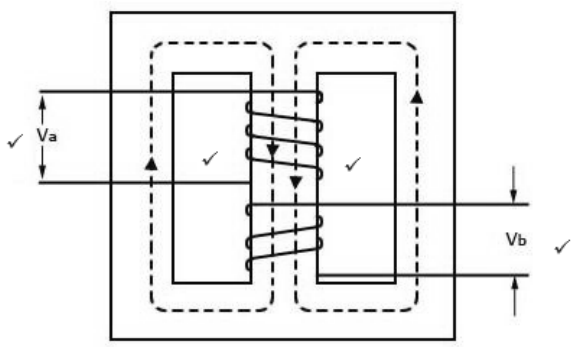
4.4
- Omkering van die veldstroom✓
- Omkering van die ankerstroom✓ (2)

[20]

VRAAG 5

5.1
- Ster-ster
- Ster-delta
- Delta-delta
- Delta-ster (4)

5.2



(4)

5.3
- Histereseverliese
- Werwelstroomverliese (2)

5.4 'n Mens moet enige twee lyne verwissel,✓✓ L1 en L2 of L1 en L3, waarna die motor se rotasierigting sal verander. (2)

5.5 5.5.1 $\frac{V_1}{V_2} = \frac{N_1}{N_2}$

$N_2 = \frac{N_1 V_2}{V_1} = \frac{600 \times 16}{220}$✓

$= 43{,}636$

$= 44\ wikkelings$✓

5.5.2 $\frac{V_1}{V_2} = \frac{I_2}{I_1}$

$I_1 = \frac{I_2 V_2}{V_1}$

$= \frac{5 \times 16}{220}$✓

$= 0{,}364\ \text{A}$✓

5.5.3 $S = VI = 220 \times 0{,}364 = 80{,}08\ \text{VA}$✓✓

OF

$S = VI = 16 \times 5 = 80\ \text{VA}$✓✓

5.5.4 $\frac{V_1}{V_2} = \frac{220}{16}$

$= 220:16$✓

$= 55:4$✓ **OF** $= 14:1$

(4 × 2) (8)
[20]

TOTAAL: 100

Kopiereg voorbehou