higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

ELEKTROTEGNOLOGIE N3

6 AUGUSTUS 2018

Hierdie nasienriglyn bestaan uit 8 bladsye.

Kopiereg voorbehou

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VRAAG 1

1.1 Wringkrag is ’n roterende krag wat draaibeweging voortbring.

OF

Wringkrag bring rotasie voort. (Enige 1 x 2) (2)

1.2
- Laers word gebruik om ’n draaianker te ondersteun.
- Laers word gebruik om wrywing te minimaliseer. (2)

1.3

(2 x 2) (4)

1.4
- Om borsels met ’n onderlaag te bedek verwys daarna om die vierkantige voorvlak van ’n nuwe borsel in ’n konkaaf voorvlak te verander.
- Onderlaagbedekking is afgehandel wanneer die borsels met amarilpapier fyngemaak word sodat dit die boog van die kommutator aanneem. (2)

[10]

VRAAG 2

2.1
- Faraday se wet van elektromagnetiese induksie bepaal dat, wanneer ’n geleier of spoel deur magnetiese vloed gesny word of dit sny, ’n EMK daarin geïnduseer word.
- Faraday se wet van elektromagnetiese induksie bepaal dat ’n EMK of oopkringspanning altyd in ’n spoel geïnduseer word wanneer die magnetiese vloed wat met die spoel skakel, verander. (Enige 1 x 3) (3)

2.2 2.2.1 Hulppole is halfpad tussen die hoofpole geleë. (1)

2.2.2 Ankerstroom (I_a) (1)

2.3 2.3.1
$$E = V + I_a R_a$$
$$= 400 + (30)(0{,}25)\checkmark$$
$$= 407{,}5\ \text{V}\checkmark$$
(2)

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2.3.2 $I_{sh} = \frac{V}{R_{sh}} = \frac{400}{180} = 2{,}222\ \text{A}$✓

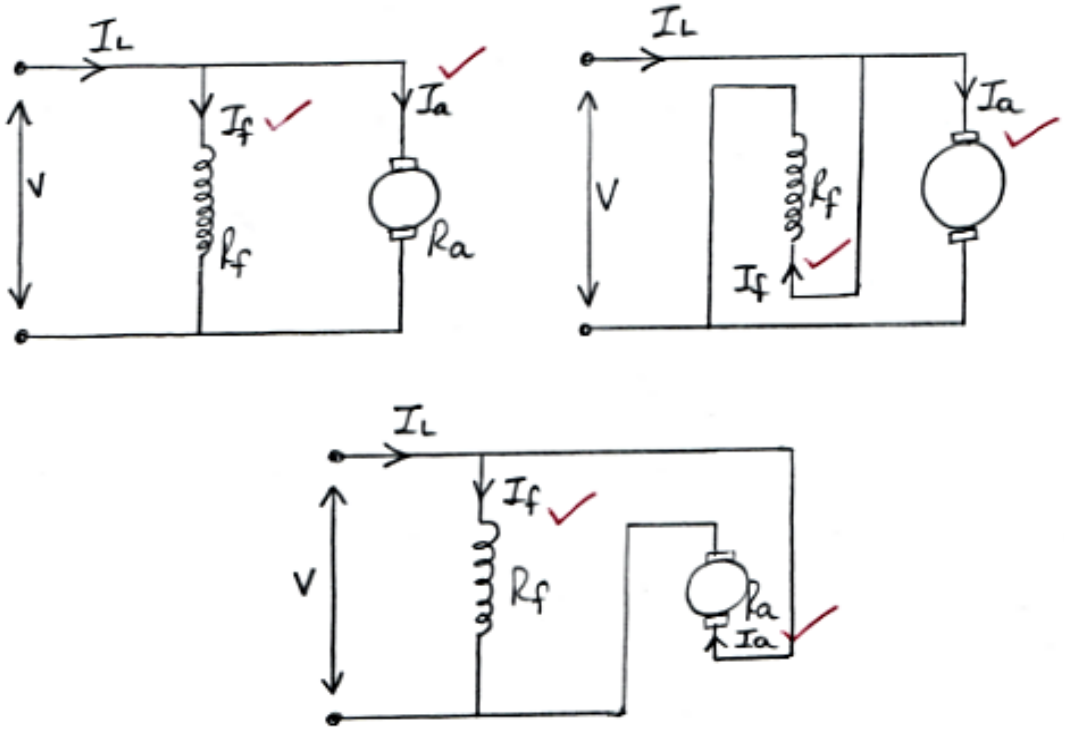
$I_L = I_a - I_{sh} = 30 - 2{,}222 = 27{,}778\ \text{A}$✓

$P_o = VI_L = (400)(27{,}778) = 11{,}111\ \text{kW}$✓ (3)

[10]

VRAAG 3

3.1



(6)

3.2 $E = V - I_aR_a + I_aR_{se}$

$= 400 - (35)(0{,}15 + 0{,}2)$✓

$= 387{,}75\ \text{V}$✓

$E = \frac{2\emptyset NpZ}{60\,c}$

$N = \frac{60\,Ec}{2\emptyset pz}$

$= \frac{(60)(387{,}75)(2)}{(2)(33\times10^{-3})(3)(740)}$ ✓

$= 317{,}568\ \text{r/min}$✓ (4)

[10]

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VRAAG 4

4.1 4.1.1 Wrywingverliese kom voor in die vorm van warmte in laers asook tussen die borsels en kommutator.

4.1.2 Windweerstandverliese kom voor wanneer die anker en koelwaaier probeer om lug- of windweerstand te oorkom.

(2 × 2) (4)

4.2 $P_o = VI_L$

$I_L = \frac{22\times10^3}{300} = 73{,}333\text{ A} = I_1$ ✓✓

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

$= \sqrt{\frac{73{,}333}{73{,}333+12}} \times 100\%$✓

$= 92{,}702\%$✓ (4)

4.3 In 'n differensiaalserieparallelmotor werk die magnetiese velde wat deur die serie- en omtakwikkelinge voortgebring teen mekaar. Die gevolg is 'n swakker magnetiese veld. (2)

[10]

VRAAG 5

5.1 Die WGK-waarde van 'n wisselstroom verteenwoordig daardie waarde van wisselstroom wat dieselfde hoeveelheid warmte as sy gelykstroom-ekwivalent voortbring. (3)

5.2 'n Periode is die tydsduur in sekondes wat 'n golfvorm neem om 'n volledige siklus te voltooi. (2)

5.3 5.3.1 $E_{avg} = \frac{e_1+e_2+e_3+e_4+e_5+e_6}{6}$

$= \frac{32+41+47+65+56+29}{6}$✓

$= 45\text{ V}$✓ (2)

5.3.2 $E_{rms} = \sqrt{\frac{e_1^2+e_2^2+e_3^2+e_4^2+e_5^2+e_6^2}{6}}$

$= \sqrt{\frac{32^2+41^2+47^2+65^2+56^2+29^2}{6}}$✓

$= 46{,}755\text{ V}$✓ (2)

5.3.3 $k_f = \frac{E_{rms}}{E_{avg}} = \frac{46{,}755}{45} = 1{,}039$ (1)

[10]

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VRAAG 6

6.1 $P = VI\cos\emptyset$

$I = \frac{3\,000}{(240)(1)} = 12{,}5\text{ A}$✓

$R = \frac{240}{12{,}5} = 19{,}2\ \Omega$✓ (2)

6.2 $Z = \frac{V}{I} = \frac{400}{12{,}5} = 32\ \Omega$✓

$X_L = \sqrt{Z^2 - R^2}$

$= \sqrt{32^2 - 19{,}2^2}$✓

$= 25{,}6\ \Omega$✓

Maar $X_L = 2\pi fL$

$L = \frac{25{,}6}{2\pi(50)}$✓

$= 0{,}081\text{ H}$ **OF** $= 81\text{ mH}$✓ (5)

6.3 $\cos\emptyset = \frac{R}{Z} = \frac{19{,}2}{32}$ ✓

$= 0{,}6$ naloop✓✓ (3)
[10]

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VRAAG 7

7.1 7.1.1 $X_L = 2\pi fL$

$= 2(\pi)(50)(200 \times 10^{-3})$

$= 62{,}832\ \Omega$✓

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

$= \frac{1}{2(\pi)(50)(125\times10^{-6})}$

$= 25{,}465\ \Omega$✓

$Z_T = \sqrt{R^2 + (X_L - X_C)^2}$

$= \sqrt{65^2 + (62{,}832 - 25{,}465)^2}$

$= 74{,}975\ \Omega$✓ (3)

7.1.2 $I_T = \frac{V_T}{Z_T} = \frac{150}{74{,}975}$✓

$= 2\ \text{A}$✓ (2)

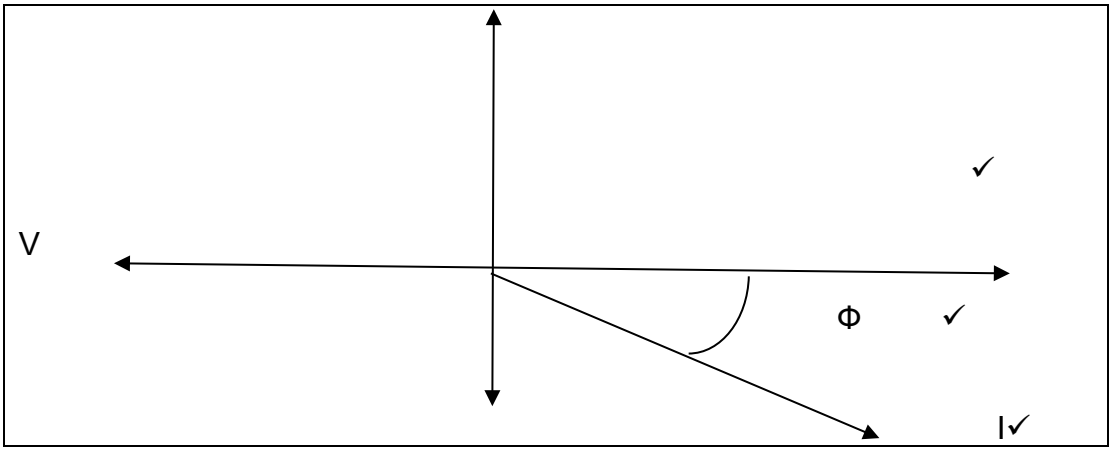
7.1.3 Vir resonansie

$f = \frac{1}{2\pi\sqrt{LC}}$

$= \frac{1}{2\pi\sqrt{(200\times10^{-3})(125\times10^{-6})}}$✓

$= 31{,}831\ \text{Hz}$✓ (2)

7.2



(3)
[10]

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VRAAG 8

8.1
- Werwelstroomverliese
- Histereseverliese (2)

8.2 8.2.1

$$V_{p1} = \frac{V_{L1}}{\sqrt{3}} = \frac{2\,200}{\sqrt{3}} = 1\,270{,}171\text{ V}\checkmark$$

$$V_{p2} = V_{p1}\frac{N_2}{N_1} = (1\,270{,}171)\left(\frac{120}{600}\right)\checkmark$$

$$= 254{,}034\text{ V}\checkmark$$

$$V_{L2} = V_{p2} = 254{,}034\text{ V}\checkmark$$

8.2.2

$$V_{p1} = V_{L1} = 2\,200\text{ V}\checkmark$$

$$V_{p2} = V_{p1}\frac{N_2}{N_1} = (2\,200)\left(\frac{120}{600}\right)\checkmark$$

$$= 440\text{ V}\checkmark$$

$$V_{L2} = \sqrt{3}\,V_{p2} = 762{,}102\text{ V}\checkmark$$

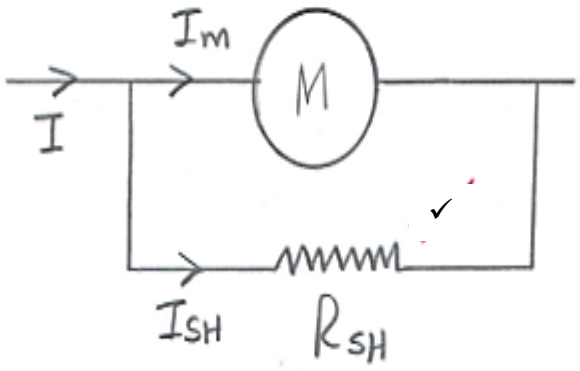
(2 × 4) (8)
[10]

VRAAG 9

9.1 9.1.1 5 A
9.1.2 110 V

(2 × 1) (2)

9.2 9.2.1



$$I_{sh} = I - I_m = 7 - 0{,}03 = 6{,}97\text{ A}\checkmark$$

$$R_{sh} = \frac{I_m R_m}{I_{sh}} = \frac{(0{,}03)(70)}{6{,}97}\checkmark$$

$$= 0{,}301\ \Omega\checkmark$$

(4)

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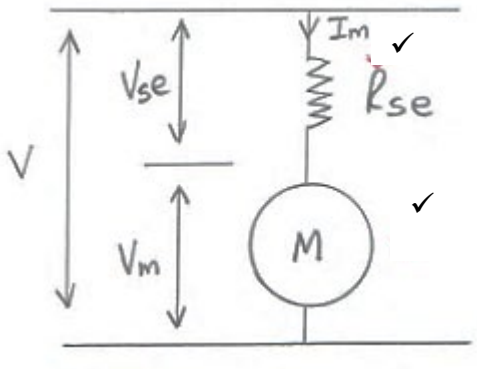
9.2.2



$$R_{se} = \frac{V}{I_m} - R_m$$

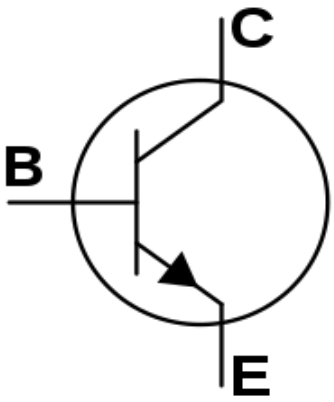
$$= \frac{150}{0,03} - 70\checkmark$$

$$= 4\,930\ \Omega\checkmark$$

(4)
[10]

VRAAG 10

10.1



C = KOLLEKTOR; ✓
E = EMITTOR; ✓
B = BASIS ✓ KORREKTE TEKENING ✓ (4)

10.2
- Motorspoedbeheer
- Gereguleerde kragvoorrade
- Batterylaaiers
- Relêbeheer (2)

10.3
110
+ 110
1100

(Ken ’n punt toe vir elke syfer in die antwoord) (4)
[10]

TOTAAL: 100

Kopiereg voorbehou

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