higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

ELEKTROTEGNOLOGIE N3

21 April 2021

Hierdie nasienriglyn bestaan uit 8 bladsye.

Kopiereg voorbehou

VRAAG 1

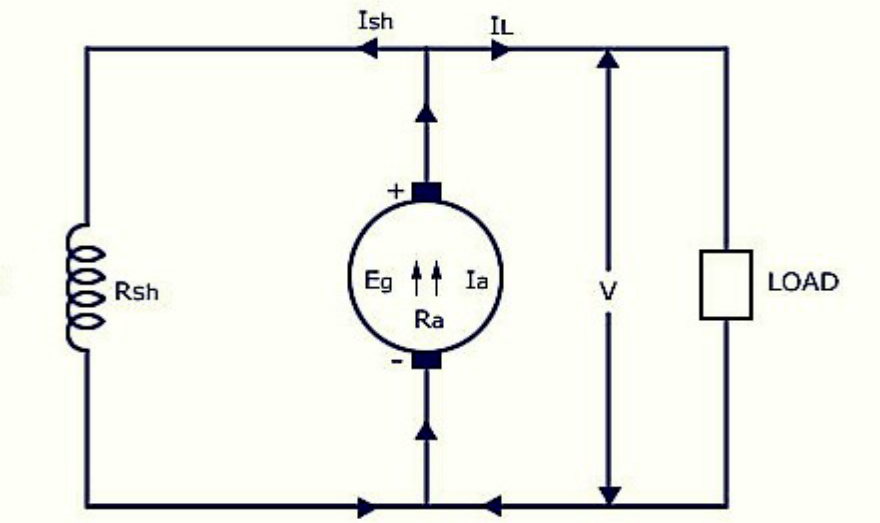
1.1 Rotor
1.2 Werwelstroomverlies
1.3 Rollaer
1.4 Soldeerwerk
1.5 Wringkrag
1.6 Motor
1.7 Kommutator
1.8 Poolskoene
1.9 Luswikkelings
1.10 Golfwikkelings

(10 × 1) **[10]**

VRAAG 2

2.1
- Seriegenerator
- Omtakgenerator
- Saamgestelde generator OF generator met lang omtak OF generator met kort omtak (3)

2.2



Anker = 1
Veldwikkelings = 1
Las = ½
Ankerstroom = ½
Veldstroom = ½
Lasstroom = ½ (4)

2.3 Die vollasaansluiterspanning is minder as die geenlasaansluiterspanning.

OF

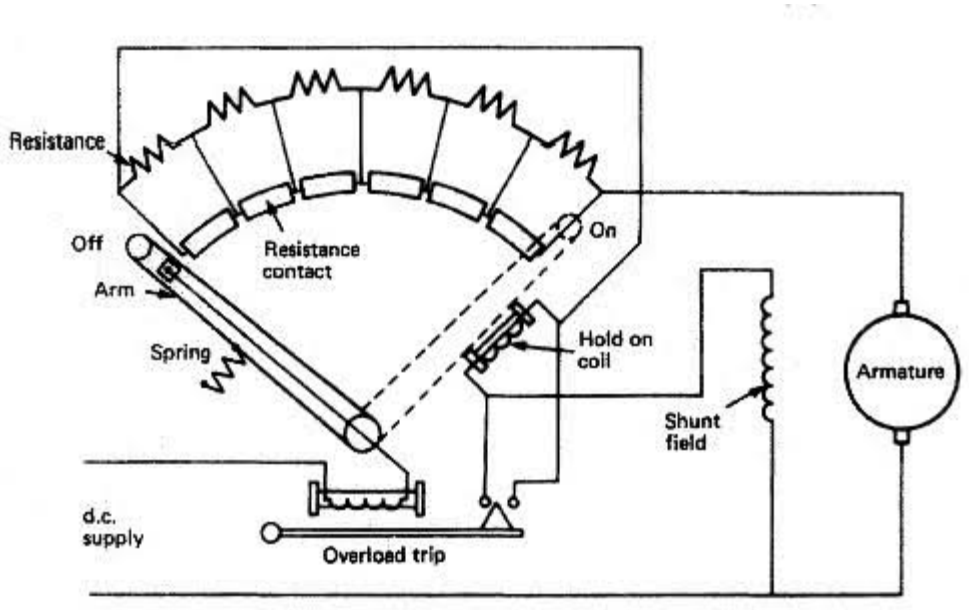
Die omtakveld is die meer dominante veld. (2)

2.4 Ankerstroom (1)

[10]

VRAAG 3

3.1



(Elke benoemde komponent = 1)(6 x 1) (6)

3.2 $P_i = \frac{P_o}{\eta} = \frac{12000}{0,93} = 12,903\ kW$✓

$P_i = VI_L \qquad I_L = I_a = \frac{12,903\times10^3}{300} = 43,01\ A$✓

$E = V - I_aR_a - I_aR_{se} = 300 - 43,01(0,15 + 0,2) = 284,947\ V$✓

$N = \frac{E}{k\emptyset} = \frac{284,947}{(15)(36\times10^{-3})} = 527,68\ r/min$✓ (4)

[10]

VRAAG 4

4.1 4.1.1 $P_o = VI_L \quad I_L = \frac{15\times10^3}{400} = 37,5\ A$✓

$I_{sh} = \frac{V}{R_{sh}} = \frac{400}{160} = 2,5\ A$✓

$I_a = I_L + I_{sh} = 37,5 + 2,5 = 40\ A$✓ (3)

4.1.2 $Ankerkoperverlies = I_a^2R_a = (40)^2(0,25) = 400\ W$ (2)

4.1.3 $Omtakveldkoperverlies = I_{sh}^2R_{sh} = (2,5)^2(160) = 1\,000\ W$✓ (1)

4.1.4 $\eta_{gen} = \frac{VI}{VI+I_a^2R_a+IsV+C} \times 100\%$✓

$\eta_{gen} = \frac{15\,000}{15\,000 + 400 + 1\,000 + 550} \times 100\%$✓ $= 88,496\ \%$ (2)

4.2 4.2.1 Swinburne-metode OF sommering van verliese OF indirekte metode

4.2.2 Hopkinson se rug-aan-rug toetse of regeneratiewe metode

(2 × 1) (2)
[10]

VRAAG 5

5.1
- Kapasitorbanke
- Fasevoorskuiwer
- Oor-opwek sinchrone motors of kapasitors (Enige 2 × 1) (2)

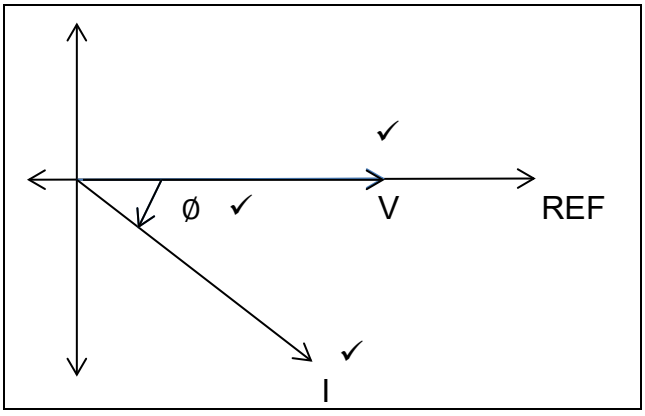
5.2 5.2.1 $199{,}75 = 240\sin(1\,570t \times 57{,}3)$✓
$\sin(1\,570t \times 57{,}3) = \frac{199{,}75}{240}$
$1\,570t \times 57{,}3 = 56{,}305°$✓
$\therefore t = 0{,}626\,ms$✓ (3)

5.2.2 $240 = 240\sin(1\,570t \times 57{,}3)$✓
$\sin(1\,570t \times 57{,}3) = \frac{240}{240}$
$1\,570t \times 57{,}3 = 90°$ ✓
$\therefore t = 1\,ms$ ✓ (3)

5.2.3 $e = 240\sin[1\,570(0{,}5 \times 10^{-3})(57{,}3)]$✓
$= 240(0{,}707)$
$= 169{,}68\,V$✓ (2)
[10]

VRAAG 6

6.1



(3)

6.2 $\cos Ø = 0{,}9 \quad \therefore Ø = 25{,}842°$ ✓ (1)

6.3 $P = VI\cos Ø = (200)(4{,}5)\,(0{,}9)$✓ $= 810\,W$ ✓ (2)

6.4 $Q = VI\sin Ø = (200)(4{,}5)\,(\sin 25{,}842°$ ✓$) = 392{,}302\,VAr$ ✓ (2)

6.5 Induktiewe las✓ omdat dit oor 'n nalooparbeidsfaktor beskik.✓ (2)
[10]

VRAAG 7

7.1 7.1.1 $P = \sqrt{3}\ V_L\ I_L \cos \phi$

$S = \sqrt{3}\ V_L\ I_L$

$Q = \sqrt{3}\ V_L\ I_L \sin \phi$

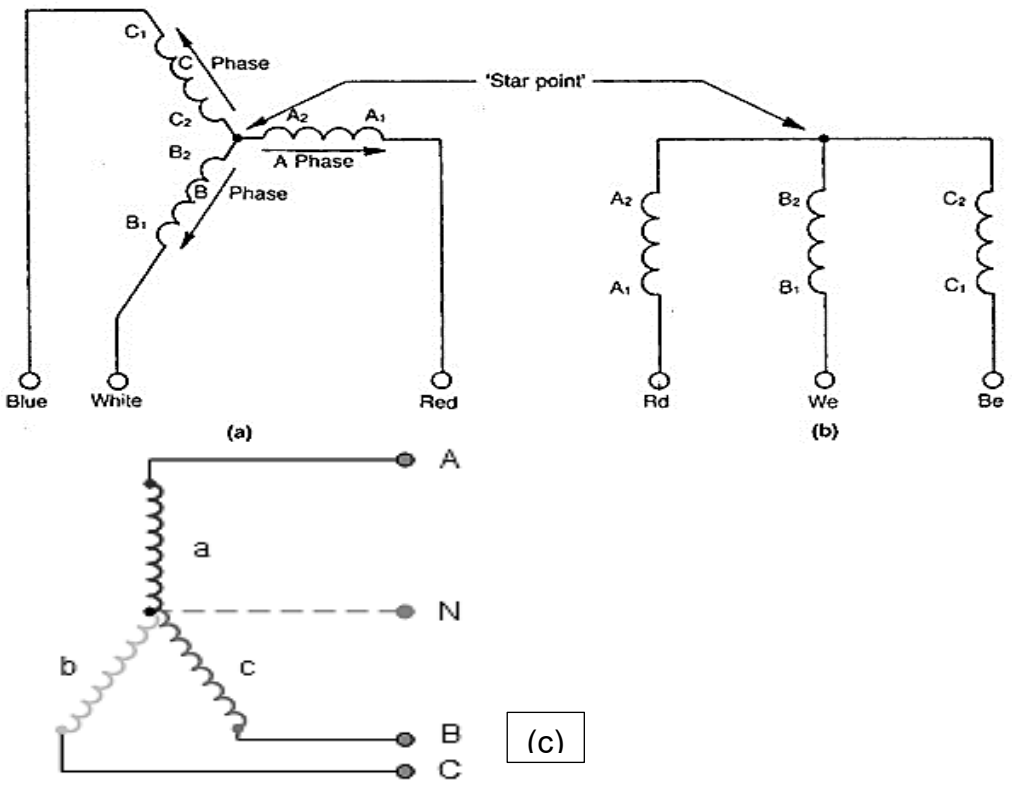
7.1.2 $P = 3V_{ph}\ I_{ph} \cos\phi$

$S = 3\ V_{ph}\ I_{ph}$

$Q = 3\ V_{ph}\ I_{ph} \sin \phi$

(3 × 2) (6)

7.2



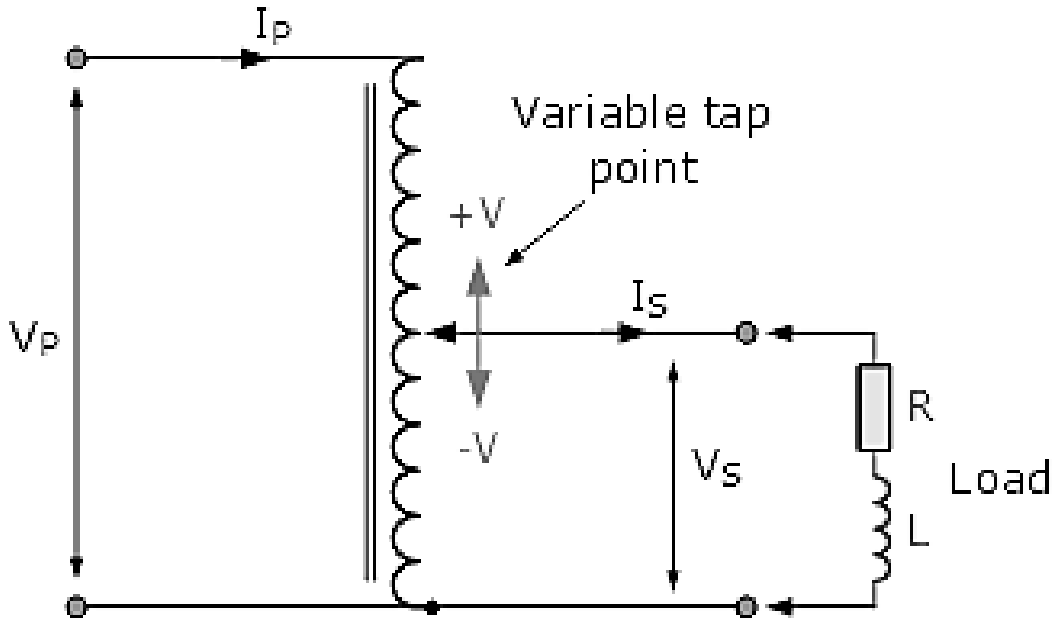
Elke aansluiter = ½ (3)

7.3 Deltaverbinding. (1)

[10]

VRAAG 8

8.1



Toevoerspanning = 1
Wikkeling = 1
Las = 1 (3)

8.2 8.2.1 $V_{P1} = \frac{V_{L1}}{\sqrt{3}} = \frac{3\,300}{\sqrt{3}} = 1\,905{,}256\ V$ (1)

8.2.2 $Windingsverhouding = \frac{V_{P1}}{V_{P2}} = \frac{1\,905{,}256}{240}$ ✓ = 7,939 : 1 ✓ (2)

8.2.3 $I_{P2} = \frac{I_{L2}}{\sqrt{3}} = \frac{145}{\sqrt{3}} = 83{,}716\ A$✓

$\frac{I_{P2}}{I_{P1}} = \frac{V_{P1}}{V_{P2}}$

$I_{P1} = I_{P2}\left(\frac{V_{P2}}{V_{P1}}\right) = (83{,}716)\left(\frac{240}{1\,905{,}256}\right) = 10{,}545\ A = I_{L1}$✓ (2)

8.2.4 $S = \sqrt{3}V_{L1}I_{L1} = \frac{\sqrt{3}(3\,300)(10{,}545)}{1\,000}$ ✓ = $60{,}273\ kVA$ ✓ (2)

[10]

VRAAG 9

9.1 9.1.1 Defleksiemeganisme – produseer 'n defleksiewringkrag of meganiese krag wat veroorsaak dat die spil draai.

9.1.2 Beheermeganisme – produseer beheerwringkrag
OF
Bepaal die grootte van die defleksie en dui ook die grootte aan van die hoeveelheid wat gemeet word
OF
Bring die wyser na nulpunt toe nadat die meting geneem is.

- 9.1.3 Dempmeganisme – produseer dempwringkrag wat die ossillasie van die wyser minimeer en dit sy finale posisie vinnig laat bereik. (3×1) (3)

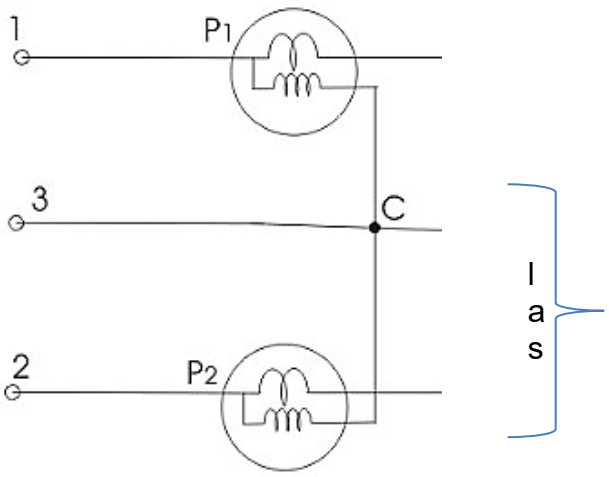
9.2 9.2.1
- Relatief goedkoop
- 'n Sterk konstruksie
- Kan gebruik word om WS- en GS-hoeveelhede te meet

(Enige 2 x 1)

9.2.2
- Redelik moeilik om te kalibreer
- Akkuraatheid word beïnvloed deur verspreide magnetiese velde en temperatuur
- Dit het nie-lineêre skale

(Enige 2 x 1)
(2 × 2) (4)

9.3

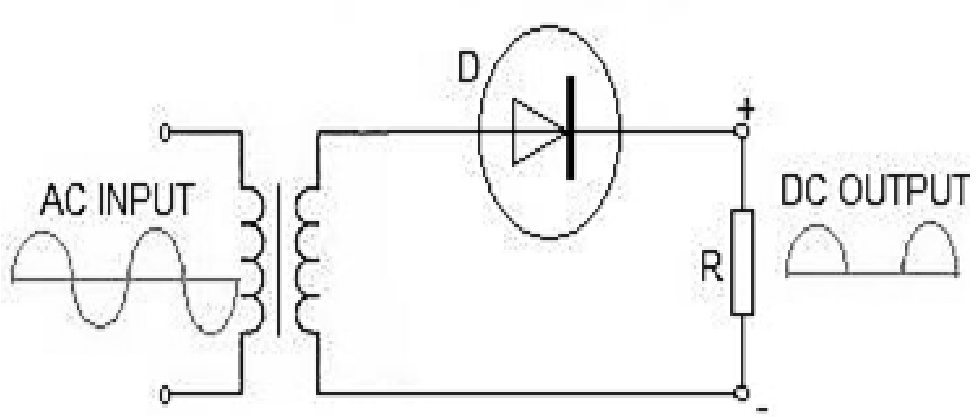


Wattmeters = 1
Las = 1 (3)
[10]

VRAAG 10

10.1
- Relêkontrole
- Motorspoedkontrole
- Gereguleerde kragbroneenhede
- Batterylaaiers
- Lampverdomping
- Tydrelêkringe
- Fasekontroles
- Verwarmerkontroles
- Statiese skakelaars (Enige 3 × 1) (3)

10.2



Insetgolfvorm = 1
Uitsetgolfvorm = 1
Diode = 1
Transformator = ½
Las = ½ (4)

10.3

```
    1 1 0 1 0
+     1 1 1 1
  1 0 1 0 0 1 2 ✓✓✓
```

Elke plekwaarde = ½ (3)
[10]

TOTAAL: 100

Kopiereg voorbehou