

GAUTENGSE DEPARTEMENT VAN ONDERWYS

SENIORSERTIFIKAAT -EKSAMEN

ELEKTISIËNSWERKSG

Possible Answers / Moontlike Antwoorde
Feb / Mar / Maart 2006

VRAAG 1
ELEKTRIESE STROOMTEORIE

$$1.1.1 \quad \begin{aligned} XL &= 2\pi fL && (1) \\ &= 2\pi \times 50 \times 0,2 && (1) \\ &= 62,83 \text{ ohm} && (1) \end{aligned}$$

$$\begin{aligned} Z &= \sqrt{R^2 + (XL - XC)^2} && (1) \\ &= \sqrt{8^2 + (62,83 - 12)^2} && (1) \\ &= \sqrt{2647,6} && (1) \\ &= 51,46 \text{ ohm} && (1) \\ V &= I \times Z && (1) \\ &= 1,2 \times 51,46 && (1) \\ &= 61,75 \text{ V} && (1) \end{aligned}$$

[10]

$$1.1.2 \quad \begin{aligned} \cos \phi &= R / Z && (1) \\ \cos \phi &= 8 / 51,46 && (1) \\ \cos \phi &= 0,155 && (1) \\ P &= VI \cos \phi && (1) \\ &= 61,75 \times 1,2 \times 0,155 && (1) \\ P &= 11,485 \text{ W} && (1) \end{aligned}$$

OF

$$\begin{aligned} P &= I^2 R && (1) \\ &= 1,2^2 \times 8 && (2) \\ &= 11,52 \text{ W} && (2) \end{aligned}$$

[5]

$$1.1.3 \quad X_c = \frac{1}{2\pi f C} \quad (1)$$

$$C = \frac{1}{2\pi f X_c} \quad (1)$$

$$C = \frac{1}{2 \times \pi \times 50 \times 12} \quad (1)$$

$$C = 265 \times 10^{-6} \text{F} \quad (1)$$

$$= 265 \mu\text{F} \quad (1)$$

[5]

[20]

1.2

| Middel-ordinate | Middel-ordinate ² |
|-----------------|------------------------------|
| 6 | 36 |
| 13,5 | 182,25 |
| 15,15 | 240,25 |
| 15 | 225 |
| 10 | 100 |
| 3 | 9 |
| 63 | 792,5 |

$$\text{Gemiddelde waarde} = e_1 + e_2 + e_3 + e_4 + \dots + e_6 / \text{getal middel-ordinate} \quad (1)$$

$$= 63/6 \quad (2)$$

$$= 10,5 \text{ V} \quad (1)$$

$$\text{Wgk-waarde} = \sqrt{e_1^2 + e_2^2 + e_3^2 + \dots + e_6^2} / \text{getal middel-ordinate} \quad (1)$$

$$= \sqrt{792,5 / 6} \quad (2)$$

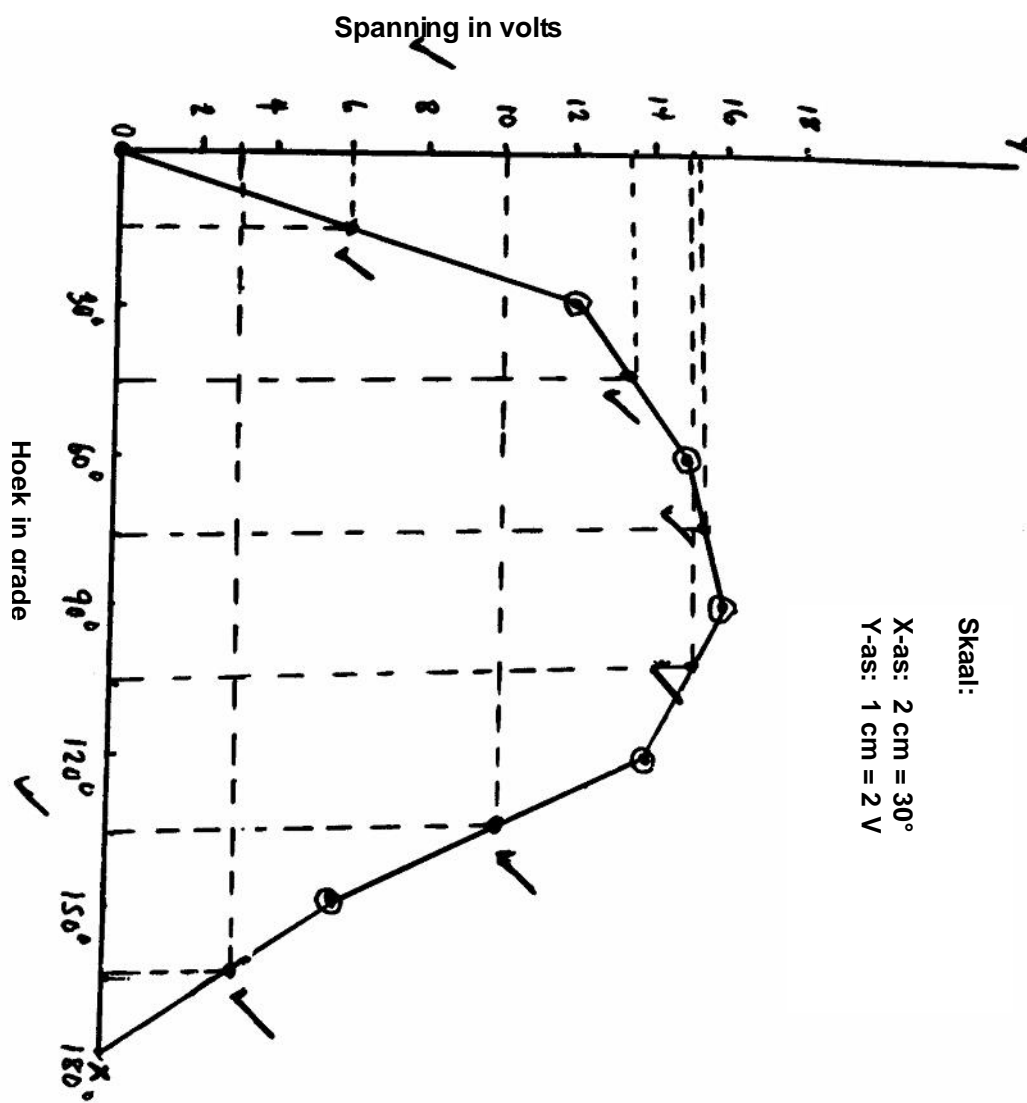
$$= 11,49 \text{ V} \quad (1)$$

$$\text{Vormfaktor} = \text{wgk} / \text{gemiddelde} \quad (1)$$

$$= 11,49 / 10,35 \quad (2)$$

$$= 1,094 \quad (1)$$

GRAFIEK

(8)
[20]

1.3.1 $I_{rms} = 0,707 \times I_m$
 $= 0,707 \times 75$
 $= 53,025 \text{ A}$

(1)
(1)
(1)

1.3.2 $2\pi f = 563$
 $f = 563/2\pi$
 $= 89,6 \text{ Hz}$

(1)
(1)
(1)

1.3.3 $i = 75 \sin(563t)$ (1)
 $= 75 \sin(563 \times 3 \times 10^{-3})$ (1)
 $= 75 \sin(1,689 \text{ rad})$
 $= 75 \sin(1,689 \times 57,3)$ (1)
 $= 75 \sin 96,77$
 $= 74,47 \text{ A}$ (1)

[10]

1.4 Sweismasjiene (1)
 Induksiemotor s (1)
 Transformators (1)

[3]

1.5 $F = 1 / T$ (1)
 $= 1 / 0,005$ (1)
 $= 200 \text{ Hz}$ (1)

[3]

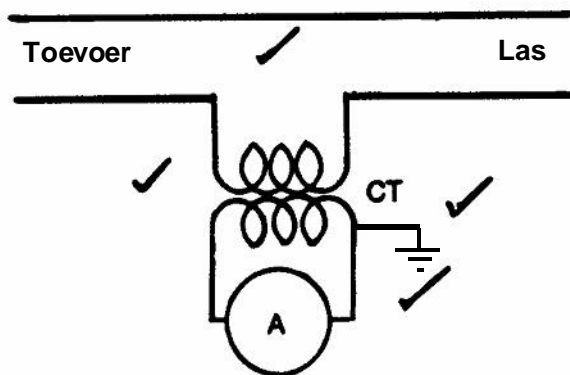
1.6 0° [2]

1.7 $? \text{ rad} = 180^\circ$ [2]

[60]

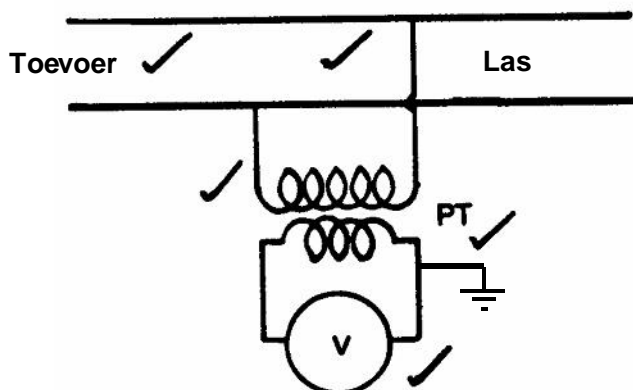
VRAAG 2

2.1.1



(4)

2.1.2

(5)
[9]

2.2.1

Konstruksie

Dit bestaan uit ? aantal triltong (dun staa lstroke) gestem om by ver skillende frekwensies te vibreer volgens hul le lengte.

Hulle word geplaas voor ? gelamineerde yster kern waarom daar ? op wekspoel gewikkel is.

(5)

2.2.2

Werking

Die op wekspoel word gekoppel oor die toevoer waarvan die frekwensie gemeet moet word. Dié wisselende magneetveld veroorsaak dat die triltong begin vibreer by die frekwensie waarvoor die spesifieke strook gesny is.

Die tritong se punte is geverf, sodat dit duidelik sigbaar is. Die triltong langs die spesifieke triltong sal ook vibreer, maar nie in dieselfde mate nie.

(5)
[10]

2.3

RENDEMENT = P LEWERING / P INSET x 100%

INSET = LEWERING / RENDEMENT x 100%

$$= 125\,000 / 0,85$$

$$= 147\,058,823\text{ W}$$

$$P_{in} = \sqrt{3} \times V_L \times I_L \times \cos \phi$$

$$I_L = P_{in} / \sqrt{3} \times V_L \times \cos \phi$$

$$= 147\,000 / 1,732 \times 380 \times 0,9$$

$$= 248,258\text{ A}$$

(1)

(1)

(1)

(1)

(1)

(2)

(1)

[8]

2.4

$$\text{Inster } V_L = \sqrt{3} \times V_p$$

$$= V_L / \sqrt{3}$$

$$= 380 / \sqrt{3}$$

$$= 219,39\text{ V}$$

$$I_L = I_p = 25\text{ A}$$

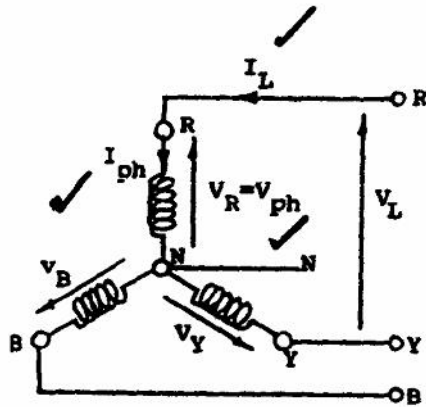
(1)

(1)

(1)

(1)

(1)



$$V_L = 380 \text{ V}$$

$$V_P = 219,39 \text{ V}$$

$$I_L = I_P = 25 \text{ A}$$

Ster-verbinding

(5)
[10]

$$\begin{aligned}
 2.5 \quad P_{in} &= \sqrt{3} \times V_L \times I_L \times \cos \phi & (1) \\
 &= \sqrt{3} \times 380 \times 25 \times 0,86 & (1) \\
 &= 14\,150,855 \text{ W} & (1) \\
 &= 14,150 \text{ kW} & [3]
 \end{aligned}$$

[40]

VRAAG 3

- 3.1 Die spannings verhoudings moet dieselfde wees. (2)
 Sowel die primêre verbindings as die sekondêre verbindings moet dieselfde wees. (2)
 Hulle moet vir dieselfde frekwensie ontwerp wees. (2)
 Die verwantskap tussen reaktansie en weerstand moet naastenby dieselfde wees. (2)

[8]

$$\begin{aligned}
 3.2.1 \quad P_S &= V_L \times I_L & (1) \\
 I_L &= P_S / V_L \quad P_S = \text{Skyndrywing} = \text{VA} & (1) \\
 &= 120\,000 / 2\,000 & (1) \\
 &= 60 \text{ A} & (1)
 \end{aligned}$$

$$\begin{aligned}
 3.2.2 \quad P_S &= V_{L2} \times I_{L2} & (1) \\
 I_{L2} &= S / V_{L2} & (1) \\
 &= 120\,000 / 380 & (1) \\
 &= 315,79 \text{ A} & (1)
 \end{aligned}$$

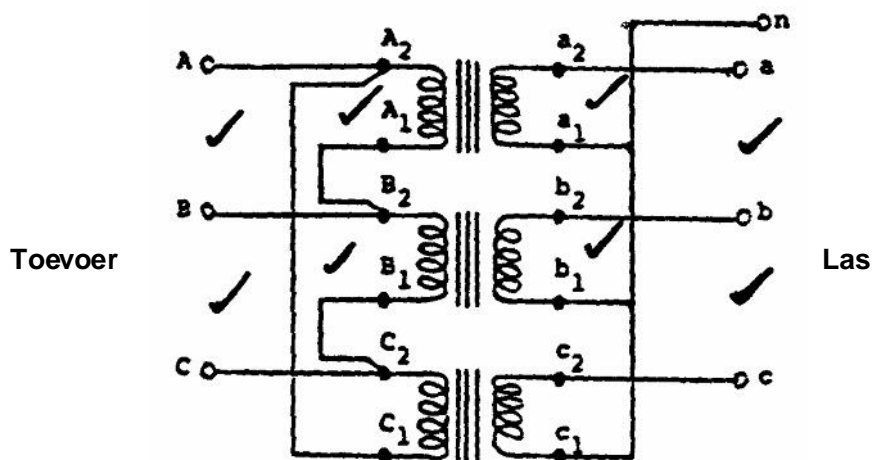
OF

$$\begin{aligned}
 V_P / V_S &= I_S / I_P & (1) \\
 I_S &= 2\,000 \times 60 / 380 & (2) \\
 I_S &= 315,79 \text{ A} & (1) \\
 (\text{DUS: } I_{L2} = I_S = 315,79 \text{ A}) & &
 \end{aligned}$$

3.2.3 $V_P / V_S = N_P / N_S$ (1)
 $N_P = V_P \times N_S / V_S$ (1)
 $= 2\,000 \times 150 / 380$ (1)
 $= 789,47$ draaie (1)
[12]

3.3 $P_S = V \times I$ (1)
 $I = P_S / V$ (1)
 $= 250\,000 / 7\,000$ (1)
 $= 35,71$ A (1)
[4]

3.4

**[8]**

3.5 Die doel daarvan is om die lug wat die transformator tenk weens die uitsetting en inkrumping binnekom droog te hou sodat daar nie vog in die transformator inkom nie.

[3]**[35]**

VRAAG 4

4.1 Sinchrone spoed is die tempo waarteen die magneetveld roteer binne in die stator. (2)

Die rotorspoed is die tempo waarteen die rotor in die roterende magneetveld roteer, met die glip in aanmerking geneem. (2)

[4]

4.2 Ware spoed = $\frac{F}{p} (1 - s)$ (1)

= $\frac{50}{3} (1 - 8\%)$ (1)

= 16,667 (1 - 0,08) (1)

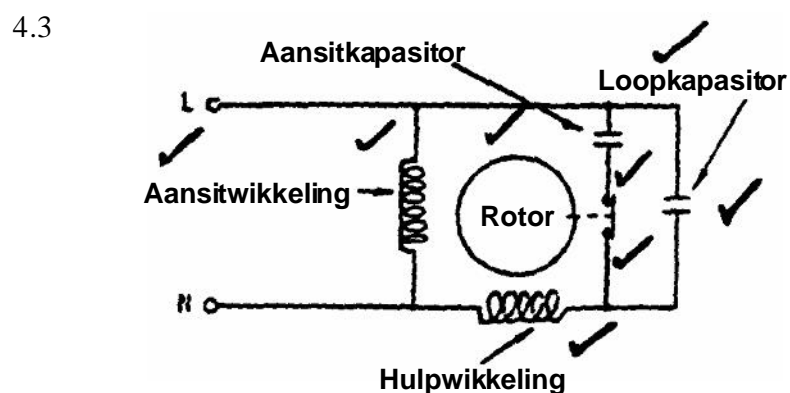
= 16,667 (0,92) (1)

= 15,33 rev. per sec (1)

= 15,33 x 60 (1)

= 920 om wente lings per minuut (1)

[7]



KAPASIT OR AANSIT-EN-LOOP MOTOR

[8]

4.4 Frekwensie (1)

Getal poolpare (1)

[2]

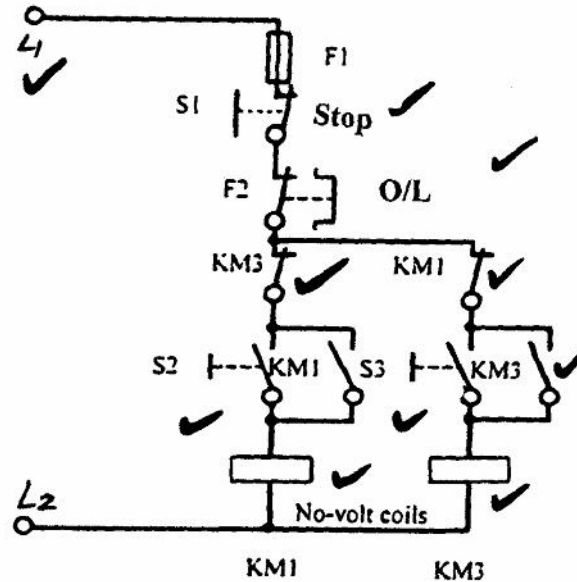
4.5 Om die hoofkontaktor aan te skakel of te aktiveer. (2)

EN

Vir veiligheid (kan nie outomaties aanskakel nie). (2)

[4]

4.6



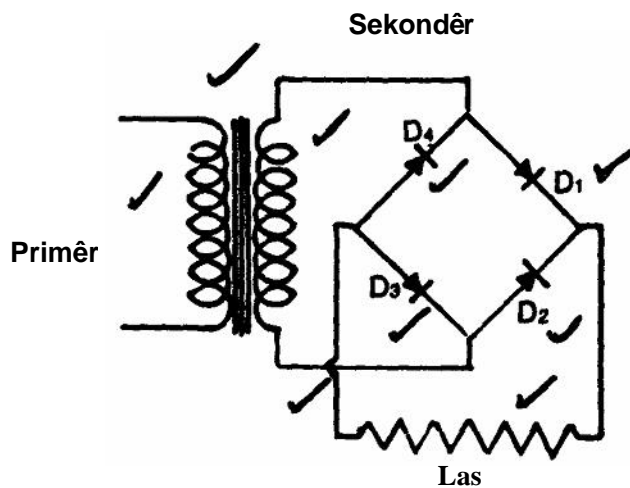
[10]
[35]

VRAAG 5

- 5.1
1. Beide stroom en spanning word versterk en hierdie konfigurasie kan dus as ? kragversterker beskou word.
 2. Die uitsetse in word relatief tot die insetse in omge keer.
 3. Die inset- en uitset-impeda nsies is in die midde lgebied d.w.s. tusse n ongeveer 1,5 en 5 kilo-ohm.

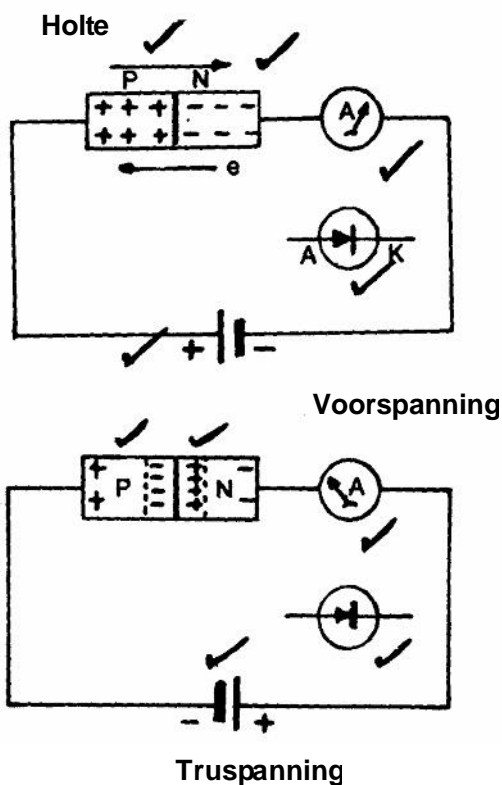
[6]

5.2



[9]

5.3



[10]

- 5.4
1. Skakel so gou as moont lik die toevoer af. (1)
 2. Indien die krag nie afgeskakel kan word nie, moet persoon van die drade weggetrek of gestoot word met isolasie materiaal. (1)
 3. Indien niks byder hand is nie, kan die geleiers met ? tang geknip of selfs met ? byl afgekap word. (1)
 4. Maak seker dat jy nie self geskok word nie. (1)
 5. Ondersoek die persoon en indien nodig kan eerstehulp op die persoon toegepas word, of ontbied en wag vir ? geneesheer. (1)

[5]

[30]

TOTAAL: 200