GAUTENGSE DEPARTEMENT VAN ONDERWYS
SENIORSERTIFIKAAT-EKSAMEN

TECHNIKA (ELEKTRIES) HG

LET WEL

Alle logiese benaderings en gevolgtrekkings moet volle krediet ontvang.

VRAAG 1
WISSELSTROOMTEORIE

1.1 $X_L = 2\pi fL$ $Xc = Xc = \frac{1}{2 \Pi fc}$

1.1.1 $= 2 \times 3,14 \times 50 \times 200 \times 10^{-3}$

$= \underline{62,8\ \Omega}$ $= \frac{1}{2x3,14 \times 50 \times 100 \times 10^{-6}}$

$= \underline{31,84\ \Omega}$

$Z = \sqrt{R^2 + (XL - Xc)^{-2}}$

$= \sqrt{(10)^2 + (62,8 - 31,8)^2}$

$= \underline{32,57\ \Omega}$ (9)

1.1.2 $\text{Cos } Ø = \frac{R}{z}$

$= \frac{10}{32,57}$

$= \underline{0,30} \longrightarrow$ (2)

1.1.3 $Ir = It \sin \varnothing$ (as $\cos \varnothing = 0{,}30$ dan is $\sin \varnothing = 0{,}95$)
$\varnothing = 72{,}5°$

$$\text{Bepaal eers } It = \frac{Vt}{Zt} = \frac{250}{32{,}57} = \underline{\quad 7{,}67 \text{ Amp} \quad} \rightarrow$$

$Ir = It \sin \varnothing$
$Ir = \quad 7{,}67 \text{ x } 0{,}95$
$= 7{,}31 \underline{\text{ Amp}} \rightarrow$ (7)

1.2.1 $W = 628$
$W = 2\pi f$
$$f = \frac{w}{2\pi}$$
$$= \frac{628}{2 \text{ x } 3{,}14}$$
$= \underline{100 \text{ Hz}} \rightarrow$ (3)

1.2.2 $$fr = \frac{1}{2\pi\sqrt{Lc}}$$
$$\frac{1}{2 \text{ x } 3{,}14 \text{ x } \sqrt{50\text{x}10^{-3} \text{ x } 200\text{x}10^{-6}}}$$
$$= \frac{1}{2 \text{ x } 3{,}14 \text{ x } 0{,}0032}$$
$= \underline{49{,}8 \text{ Hz}} \rightarrow$ (6)

1.2.3 $$Z = \frac{L}{CR}$$
$$\frac{50 \text{ x } 10^{-3}}{200 \text{ x } 10^{-6} \text{ x } 10}$$
$= \underline{25 \ \Omega} \rightarrow$ (3)

1.3.1 $R = \frac{Vg}{Ig}$

$= \frac{50}{5}$

$= \underline{10\ \Omega} \rightarrow$ (3)

1.3.2 $Z = \frac{Vws}{Iws}$

$= \frac{140}{7}$

$= \underline{20\ \Omega} \rightarrow$

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

$= \sqrt{20^2 - 10^2}$

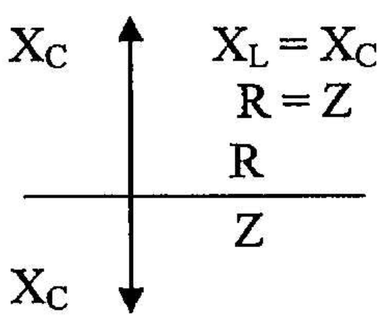
$= \sqrt{300}$

$= \underline{17{,}32\ \Omega} \rightarrow$

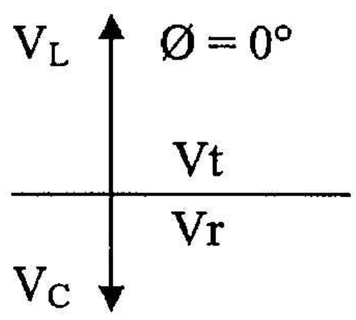
$X_L = 2\pi f_L$

$L = \frac{X_L}{2\pi f} = \frac{17{,}32}{2 \times 3{,}14 \times 60} = \underline{0{,}045} \rightarrow = \underline{45mH} \rightarrow$ (9)

1.4



OF



(4)

1.5.1 $X_L = 2\ \pi\ fL - f$ verhoog – X_L verhoog – I verklein

want $I_L = \frac{Vt}{X_L}$

1.5.2 $X_C = \frac{1}{2\ \pi\ fc}$ - f verhoog – X_C verklein – I verhoog

want $I_C = \frac{Vt}{X_c}$ (4)

[50]

VRAAG 2
EEN- EN DRIEFASIGE WISSELSTROOMSTELSELS

2.1.1 $P = \sqrt{3}\, I_L\, V_L \cos \varnothing$ 2

$2000 = 1{,}73 \times IL \times 380 \times 0{,}95 \times 0{,}9$

$$I_L = \frac{20000}{\sqrt{3} \times 380 \times 0{,}95 \times 0{,}9}$$

$= 35{,}54$ A ⟶ (4)

2.1.2 $If = \frac{I_L}{\sqrt{3}}$

$= \frac{35{,}54}{\sqrt{3}}$

$= \underline{20{,}52 \text{ A}}$ ⟶ (3)

2.1.3 $Vf = V_L$

$= \underline{380 \text{ V}}$ ⟶ (2)

2.1.4 $Zf = \frac{Vf}{If}$

$= \frac{380}{20{,}52}$

$= \underline{18{,}52\ \Omega}$ ⟶ (3)

2.1.5 $Rf = \frac{Vf}{If}$

$= \frac{380}{20{,}5}$

$= \underline{18{,}5\ \Omega}$ ⟶ (3)

2.2.1(a) $Ps = Vt \times It$

$= 220 \times 30$

$= 6600$ VA

$= \underline{6{,}6 \text{ kVA}}$ ⟶ (3)

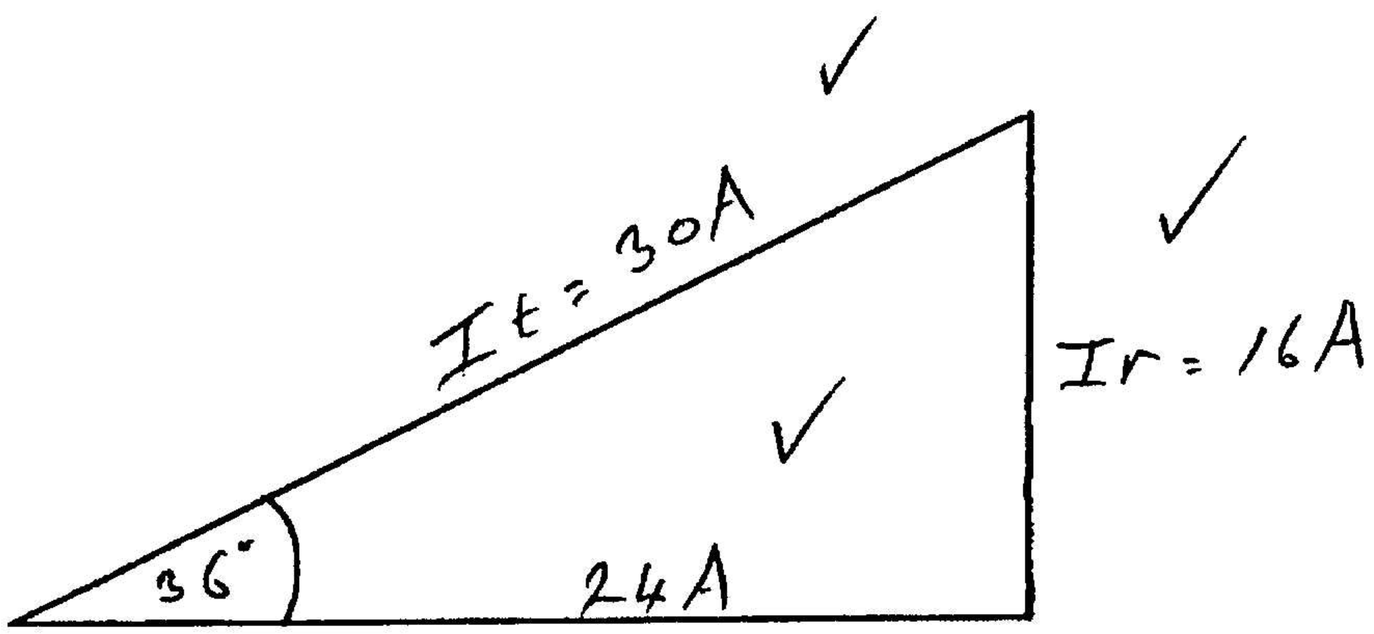
(b) $Pa = Vt \times It \times \cos \varnothing$

$= 220 \times 30 \times 0{,}8$

$= \underline{5{,}28 \text{ kW}}$ ⟶ (3)

(c) Cos Ø = 0,8
Ø = cos $^{-1}$ 0,8
= 36,87° ⟶ (2)

2.2.2 Skaal 1 cm = 3A



Ia = 24 A
Ir = 16 A (5)

2.3 * Meer doeltreffend - Meer spanningswaardes.
* Totale stroom kan oor aparte kringe versprei word.
* Dieselfde grootte raam lewer groter drywing, ens. (enige twee) (2)

[30]

VRAAG 3
TRANSFORMATORS

3.1 VLA = $\sqrt{3}$ Vf

3.1.1 = $\sqrt{3}$ x 6600
= 11,43 kV ⟶ (3)

3.1.2 VLA = V_L1
= 11,43 kV ⟶ (2)

3.1.3 Vf1 = V_L1
11,43 kV ⟶ (2)

3.1.4 $$\frac{N1}{N2} = \frac{Vf1}{Vf2}$$

$$Vf2 = \frac{N_2 \times Vf_1}{N_1}$$

$$= \frac{1 \times 11,43}{50}$$

$$= 0,22 \text{ kV}$$

$$= 228 \text{ V} \longrightarrow$$

(3)

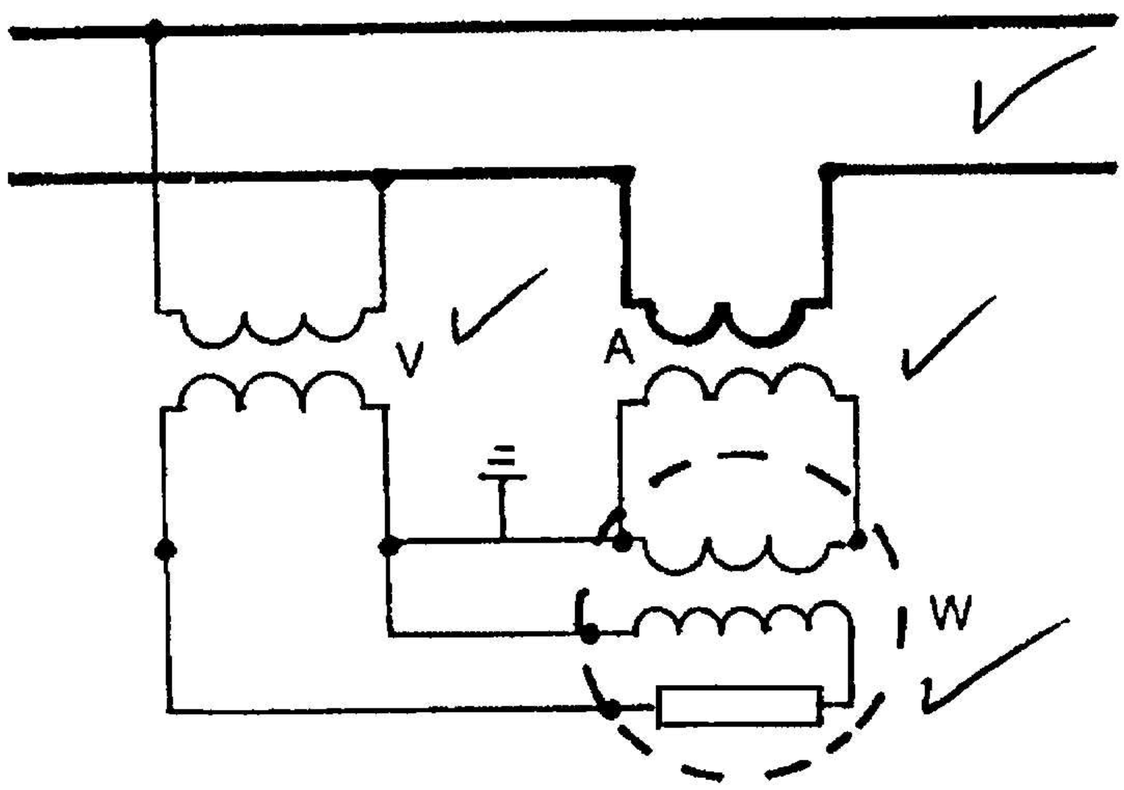
3.1.5 $VL_2 = \sqrt{3} \times Vf_2$

$= \sqrt{3} \times 228 \text{ V}$

$= 394,9 \text{ V} \longrightarrow$

(3)

3.2.1



Wattmeter in 'n kring (4)

3.2.2 $$\frac{N_1}{N_2} = \frac{I_2}{I_1} = \frac{300}{5} = \frac{60}{1}$$

dus = $N_1 : N_2$ = 1:60 $\longrightarrow$

(3)

3.3 $Is = \frac{Ps}{Vs} = \frac{45000}{750} = 60A \longrightarrow$

$\frac{NP}{Ns} = \frac{Is}{IP}$

$IP = \frac{Ns \times Is}{NP} = \frac{750 \times 60}{1000} = 450 \longrightarrow$

$I_G = I_S - I_P = 60 - 45 = 15A \longrightarrow$ (8)

3.4 Verdeel die kern van die transformator met lamelplaatjies. (2)
[30]

VRAAG 4
WISSELSTROOMMOTORS

4.1.1 $f = \frac{1}{T}$

$= \frac{1}{0,02}$

$= 50$ Hz $\longrightarrow$ (3)

4.1.2 $Ns = \frac{f}{p}$

$= \frac{50}{2}$

$= \underline{25 \text{ r/p sek.}}$

$Nr = Ns\ (S \times Ns)$
$= 25 - (0,04 \times 25)$
$= 25 - 1$
$= 24$ r/p sek. $\longrightarrow$ (4)

4.1.3 f(rotor) = Ns - Nr
= 25 - 24
= 1 Hz $\longrightarrow$ (2)

4.2 By sterverbinding is die fasespanning $\sqrt{3}$ die lynspanning, dus word die aansitstroom met 57% beperk. (2)

Sodra die motor ± 75% volspoed bereik het, skakel die windings oor na delta waar fasespanning nou gelyk is aan lynspanning en volle stroom kan nou getrek word. (2)

4.3

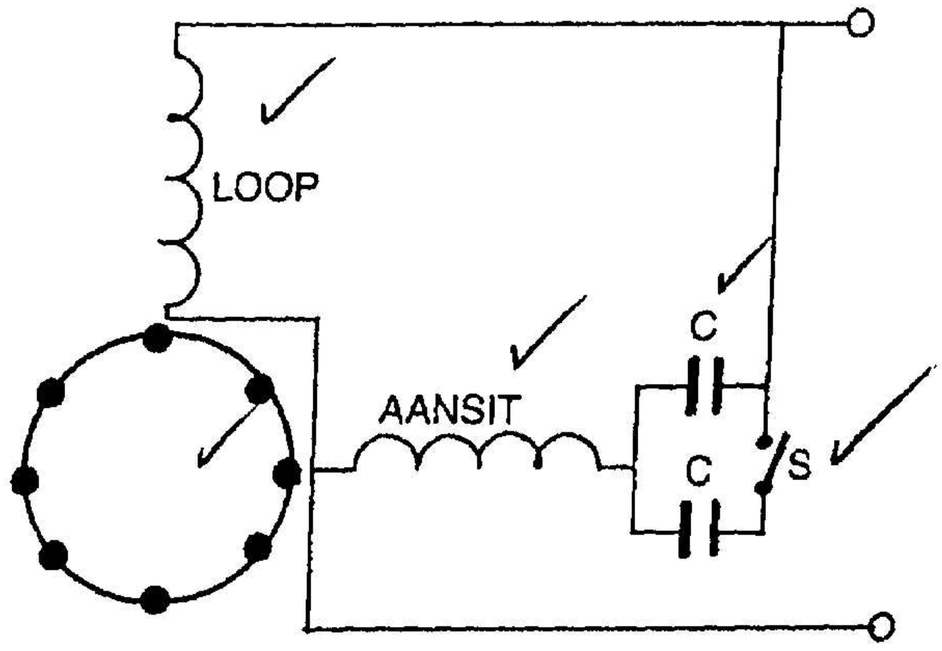
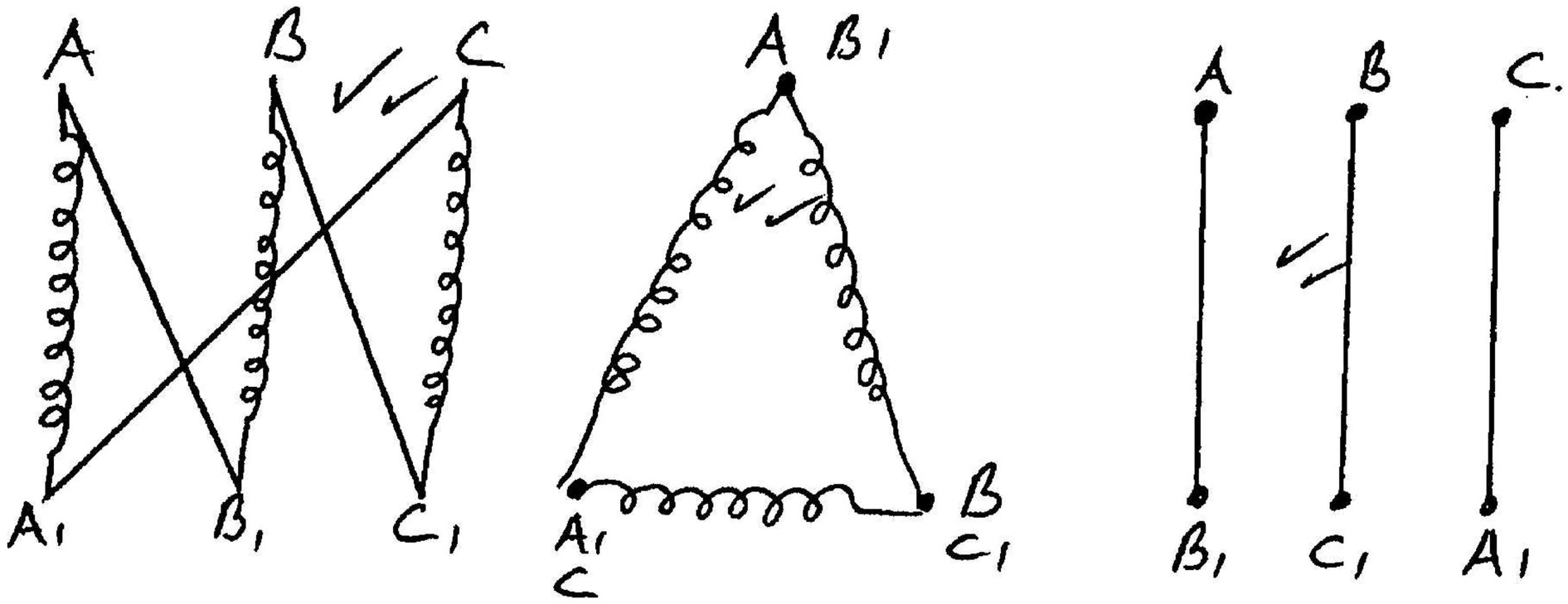


Fig. 4.28 Kapasitorloopmotor (5)

4.4 Die kapasitorloopmotor het tydens aansit 'n ekstra kapasitor in parallel wat meer kapasitansie beteken asook groter aansitwringkrag m.b.t. 'n kapasitormotor.

Die loopwringkrag van 'n kapasitorloopmotor is ook groter, aangesien een kapasitor en die aansitspoel heeltyd in die kring bly. (5)

4.5 (6)



4.6 Sodra die rotor en sincrone spoed dieselfde is, sal daar nie 'n relatiewe beweging tussen die geleier en magneetveld wees nie en 'n EMK sal dan nie in die rotor geinduseer word nie. (1)

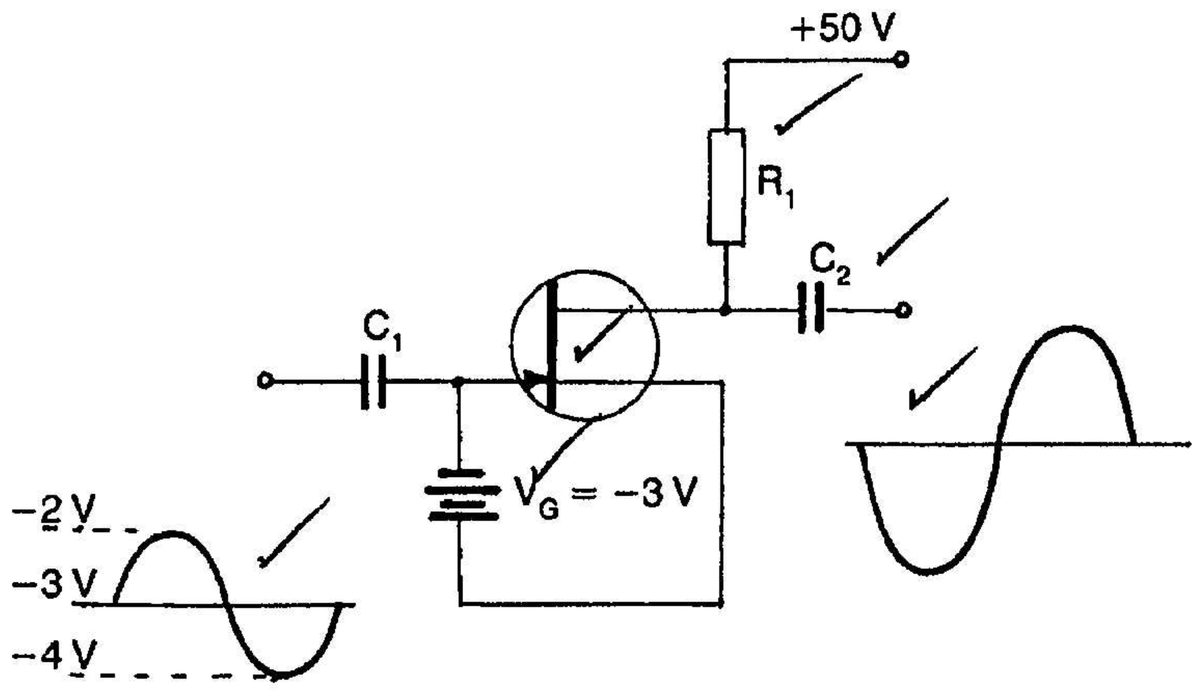
[30]

VRAAG 5
HALFGELEIERS

5.1.1 I en J
5.1.2 D en F
5.1.3 B en G
5.1.4 A en E
5.1.5 C en H (10)

5.2 *Onderbreek die Anode-Katodetoevoer
*Verminder die houstroom onder drempelwaarde (4)

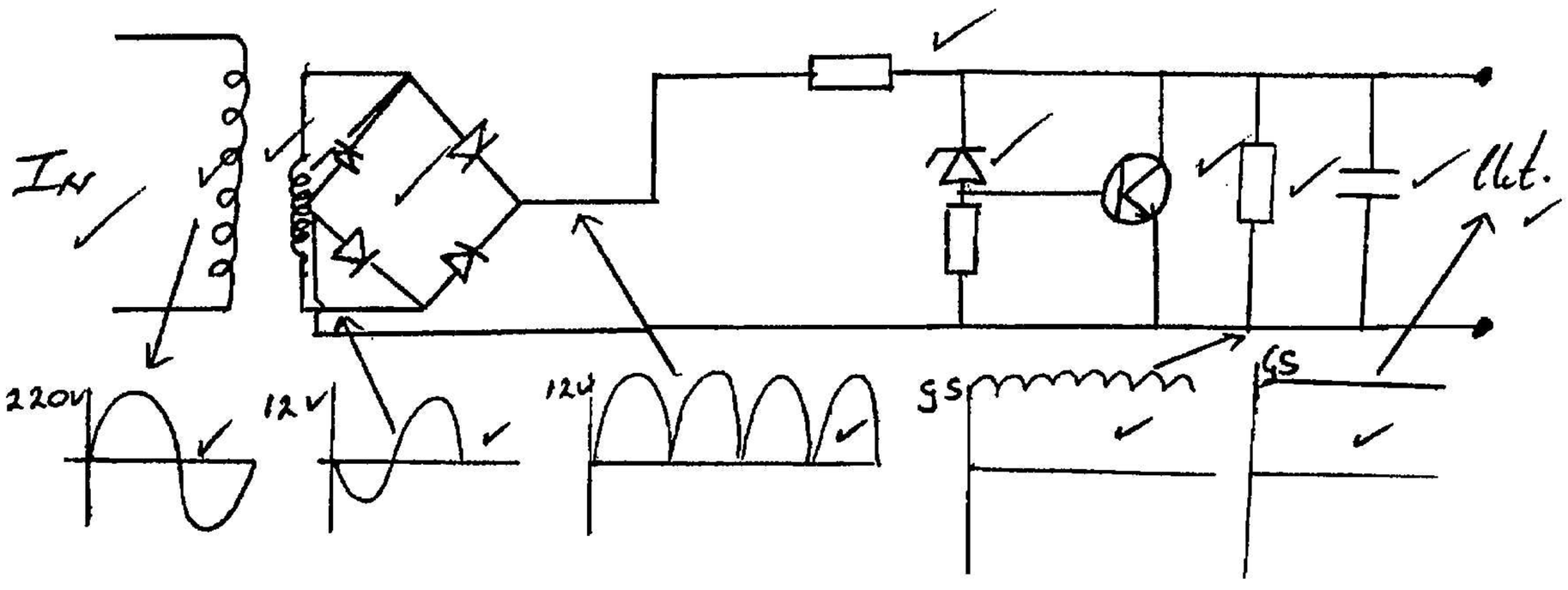
5.3



(6)

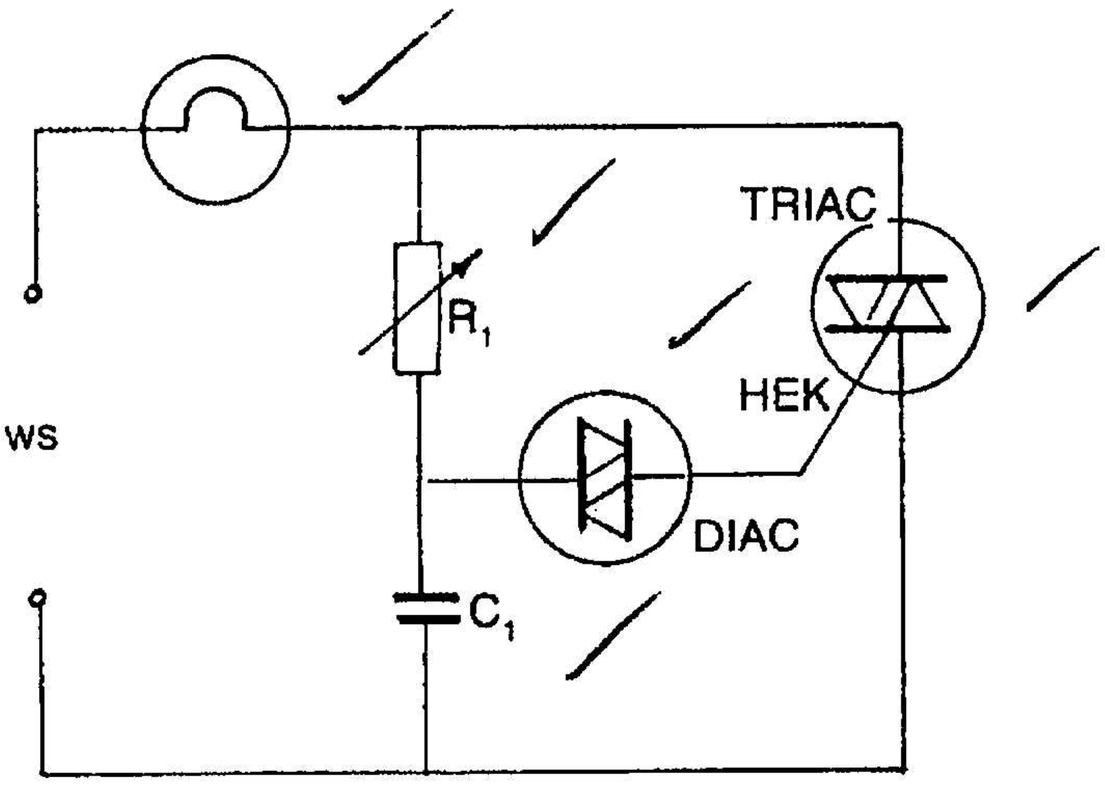
Fig. 5.24 Eenvoudige versterkerstroombaan [20]

5.4



(15)

5.5

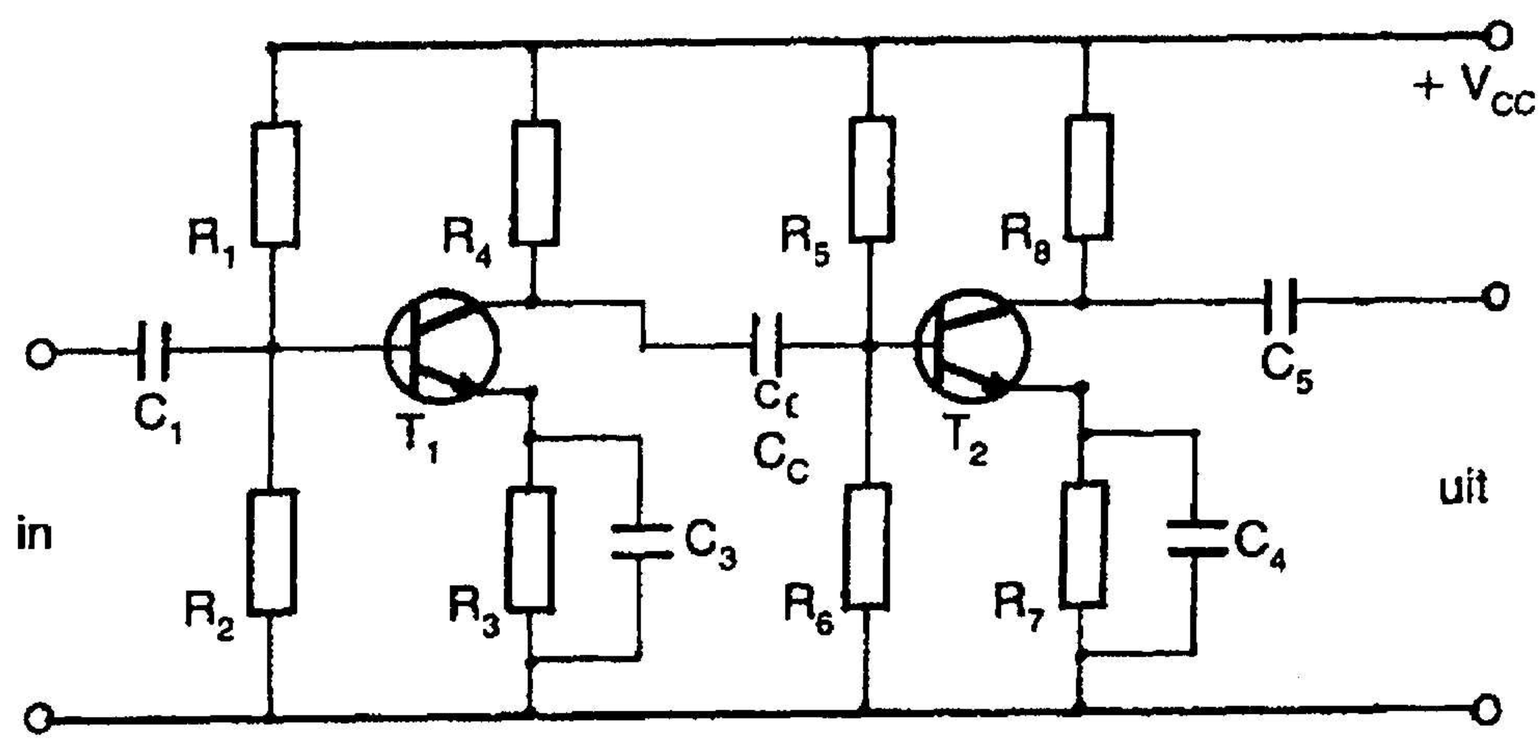


Lampdemping met behulp van 'n triac

(5)
[40]

VRAAG 6
VERSTERKERS

6.1



one mark per component
(enige een)

OF

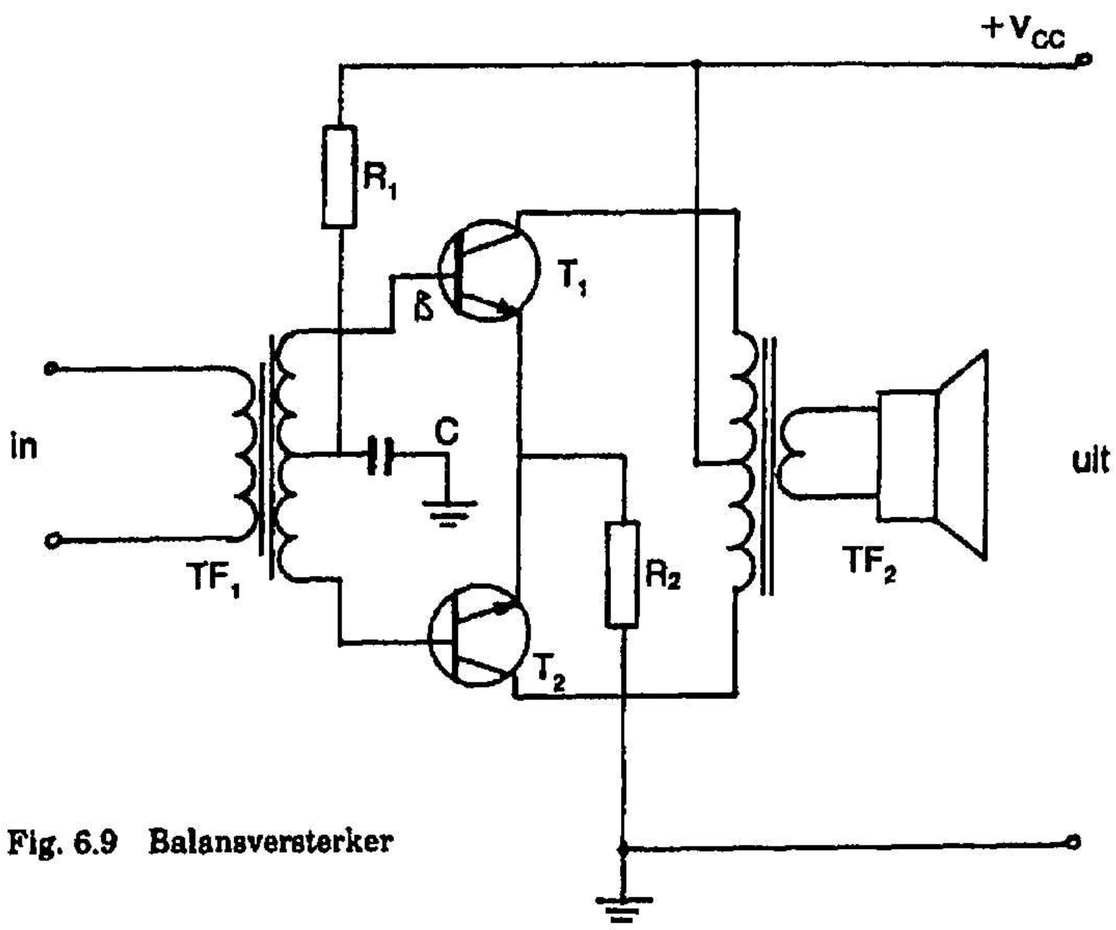


Fig. 6.9 Balansversterker

(een punt per komponent) (15)

6.2 Drywings N $= 10 \log \frac{P2}{P1}$

$= 10 \log \frac{1000}{500}$

$= 10 \log 2$

$= 10 \times 0{,}301$

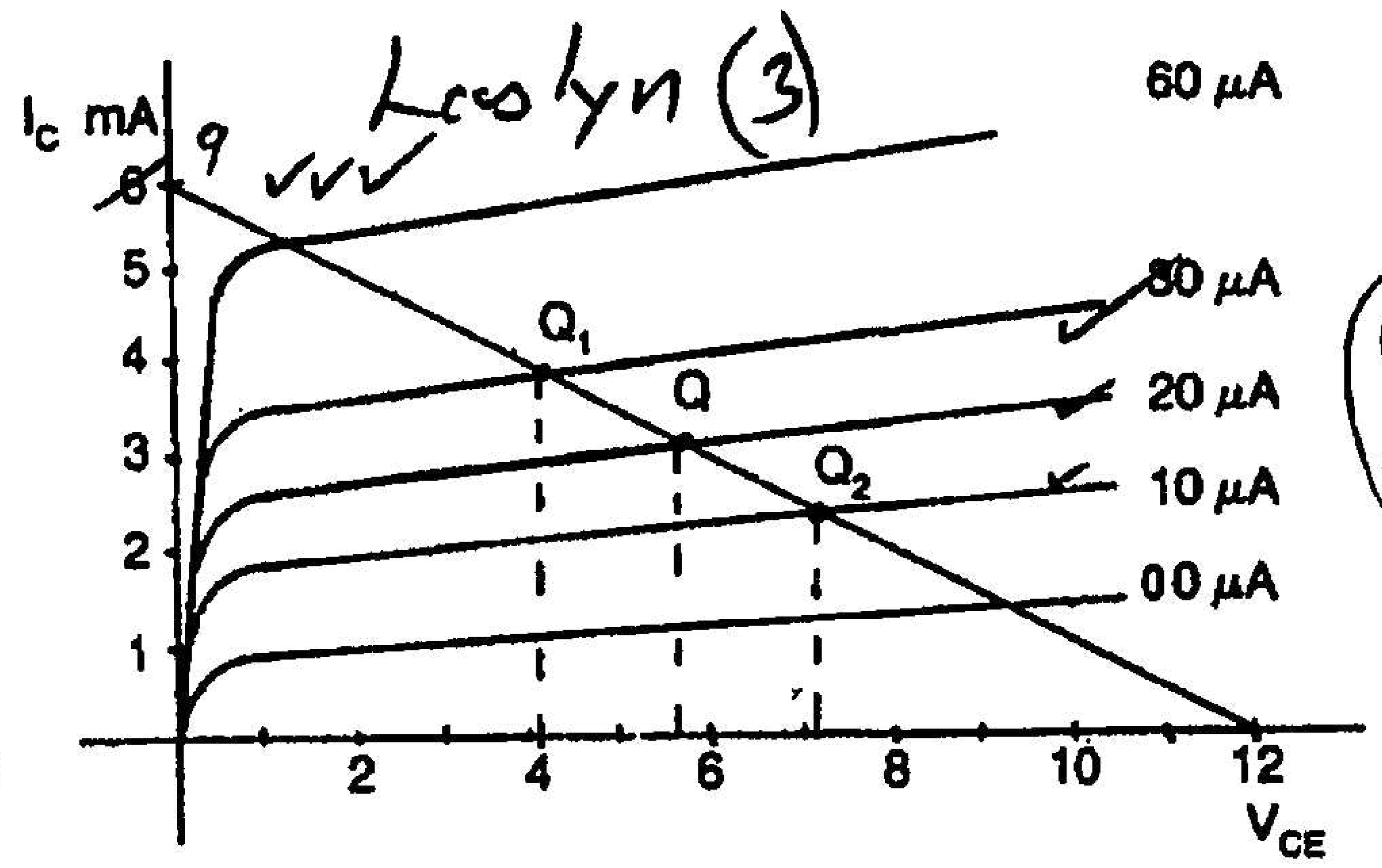
$= \underline{3dB}$ → (3)

6.3

$I_c = \frac{V_{cc}}{R_L}$ ✓

✓ $= \frac{20}{2200}$ ✓

$= \underline{9mA}$



Kurwe (3)
(Waardes nie nodig)

$V_{CE} = V_{cc}$ ✓

✓ $= 20$ Volt ✓

(12)

[30]

VRAAG 7
OSSILLATORS

7.1.1 Kristalbeheerde Hartley-ossillator (2)

7.1.2 Voorspanningsnetwerk vir Transistor T. (2)

7.1.3 C1 en L1 (2)

7.1.4 Y1 (2)

7.1.5 A.g.v. impedansieveranderinge van 'n kristal kan terugvoer verander word. (2)

7.2.1 Deel van die infase uitsetsein word teruggevoer na die insetsein om dit te versterk. (2)

7.2.2 Frekwensie waarby 'n tenkkring sal resoneer as XL = Xc. (2)

7.2.3 Die faktor grootheid waarmee die uitsetsein teruggestuur word na die inset. (2)

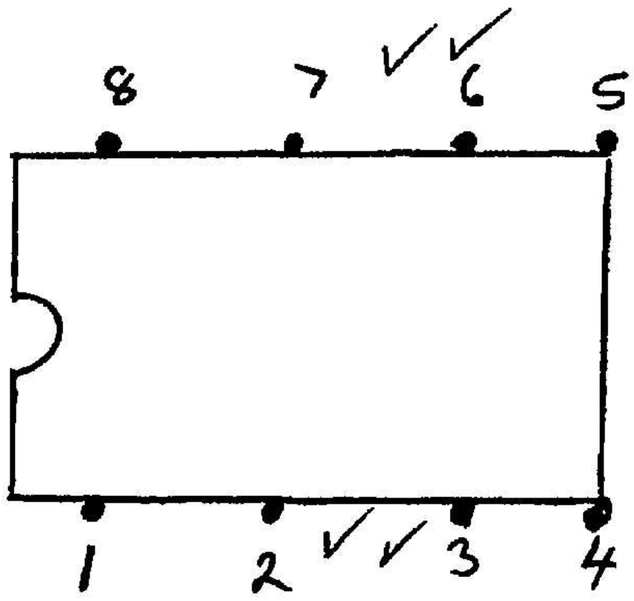
7.2.4 Die skyn kapasitansie wat die wins spanning na die grond of nullyn toelaat (kortsluit) a.g.v. die interne kapasitansie van komponente tydens hoë frekwensie. (2)

7.2.5 Die EMK wat binne 'n kristal geïnduseer word wanneer drukking daarop toegepas word. (2)

[20]

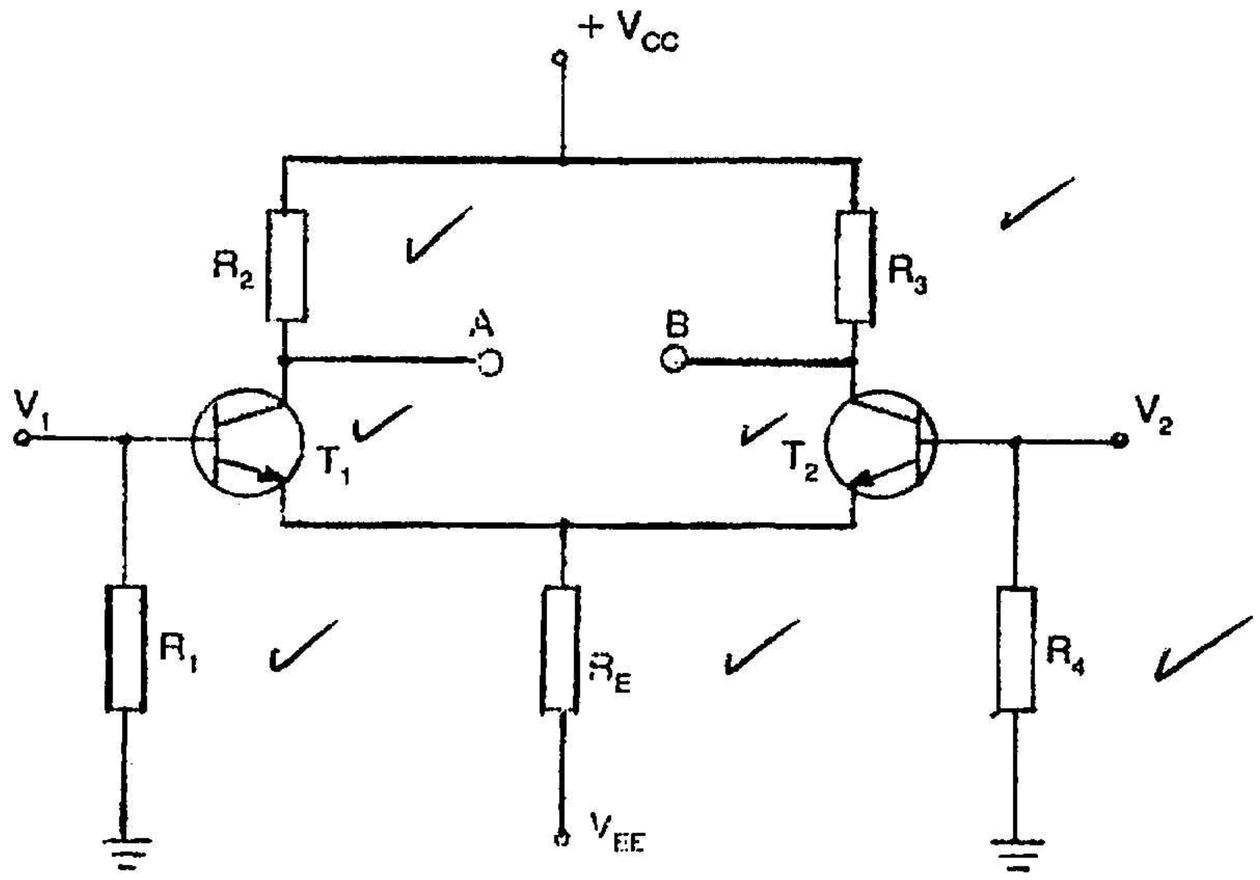
VRAAG 8
OPERASIONELE VERSTERKERS

8.1



(½ punt elk)
(4)

8.2



(7 skets)
(4 beskryw)

* Wanneer die potensiaal tussen V1 en V2 verander sal een van die transistors harder aanskakel as die ander een.

* Meer stroom sal deur die een geneem word as die ander en 'n verskil in spanning sal tussen punte A en B voorkom. (11)

[15]

VRAAG 9

9.1 (a) Waarheidstabel

A	B	C	D	
0	0	0	0	
0	0	1	0	(½ punt elk
0	1	0	0	
0	1	1	1	
1	0	0	0	
1	0	1	1	
1	1	0	1	
1	1	1	0	

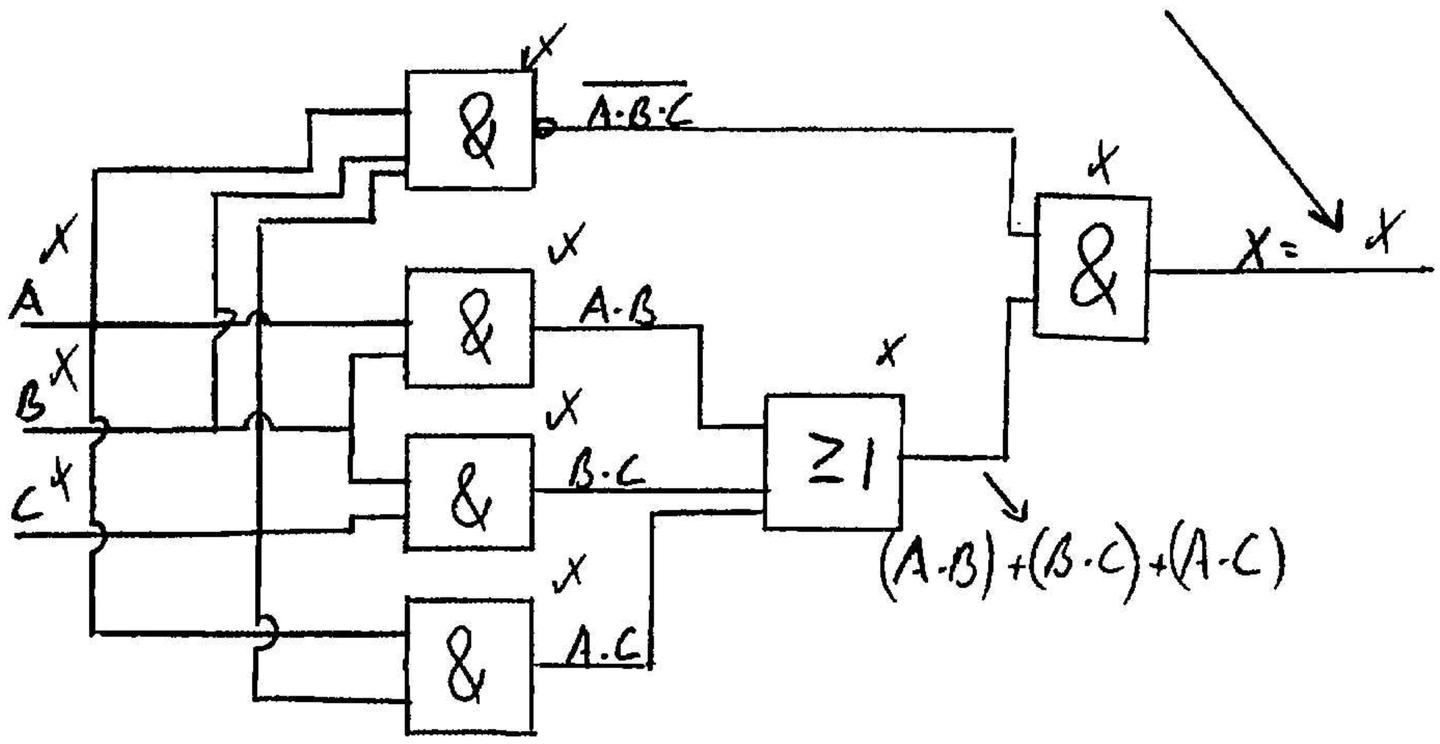
(4)

(b) Boole vergelyking

$$(A.B) + (A.C) + (B.C).(\overline{A.B.C.})$$

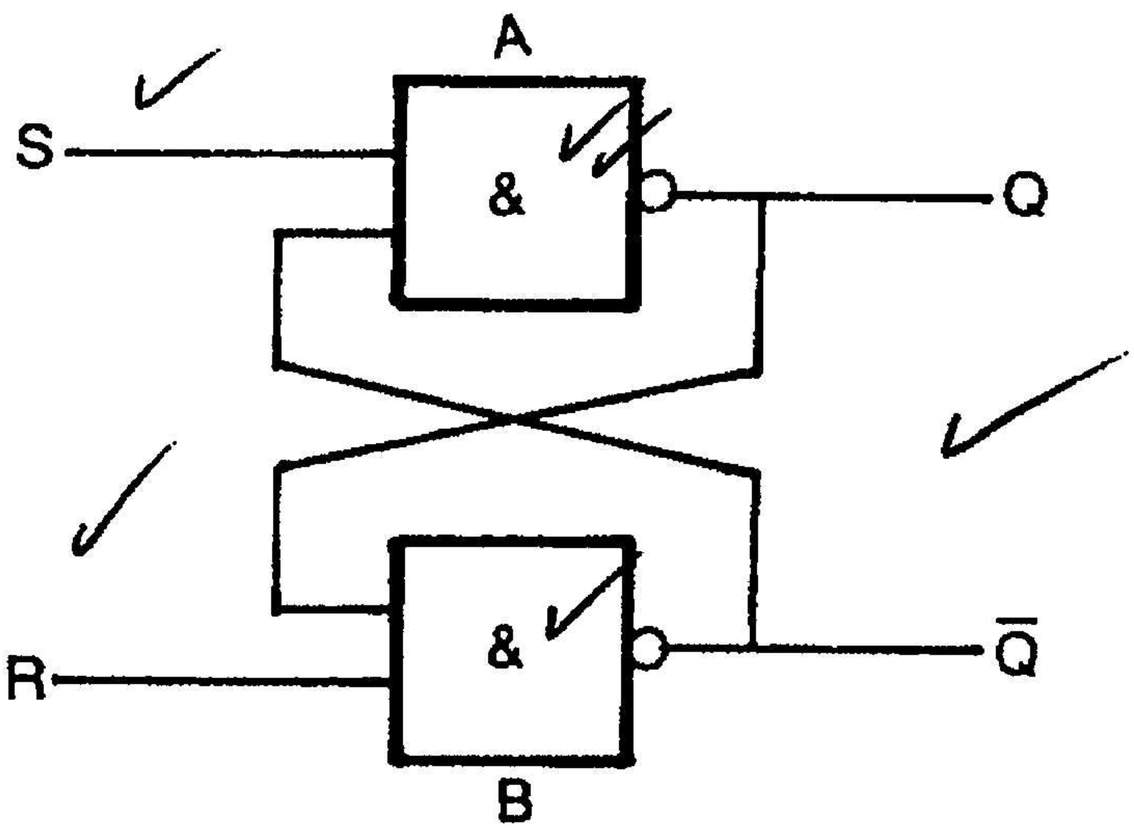
(3)

(c) Logikabaan



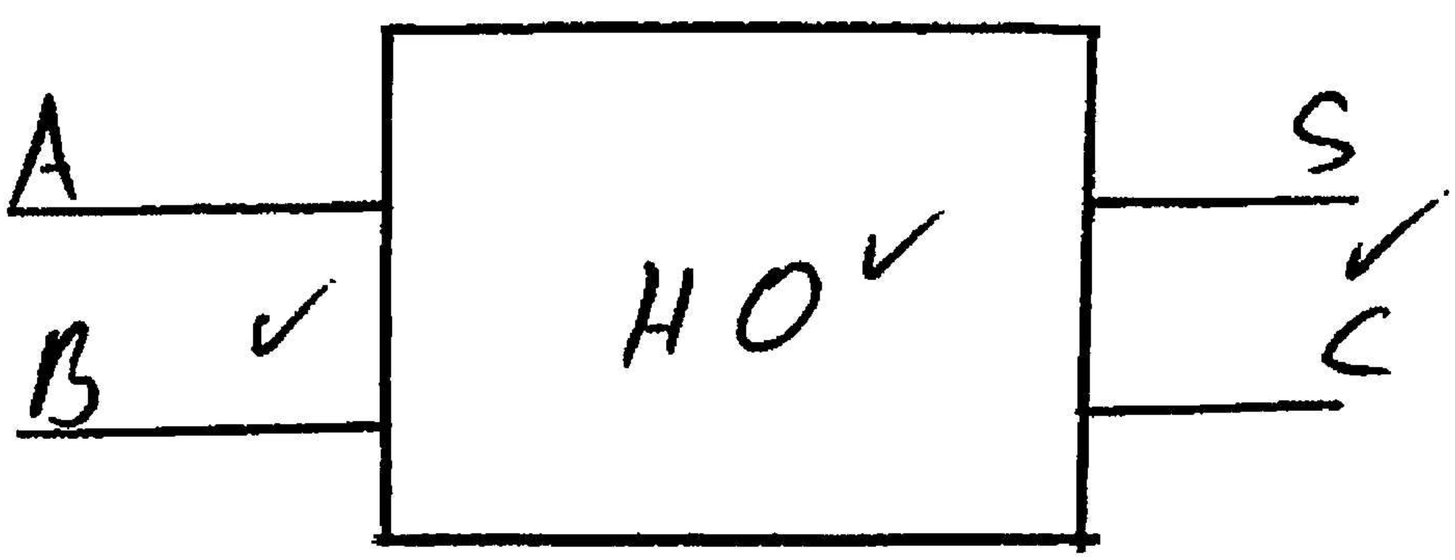
(5)

9.2



(6)

9.3



(3)

9.4

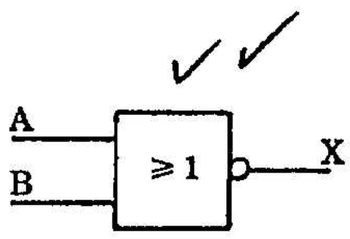


Fig. 10.7

A	B	A +B	X
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

Tabel 10.7

$X = \overline{A + B}$

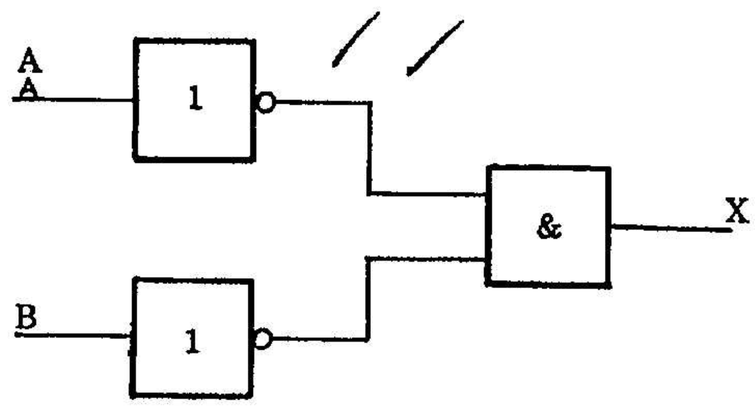


Fig. 10.8

A	B	$\overline{A}$	$\overline{B}$	X
0	0	1	1	1
0	1	1	0	0
1	0	0	1	0
1	1	0	0	0

Tabel 10.8

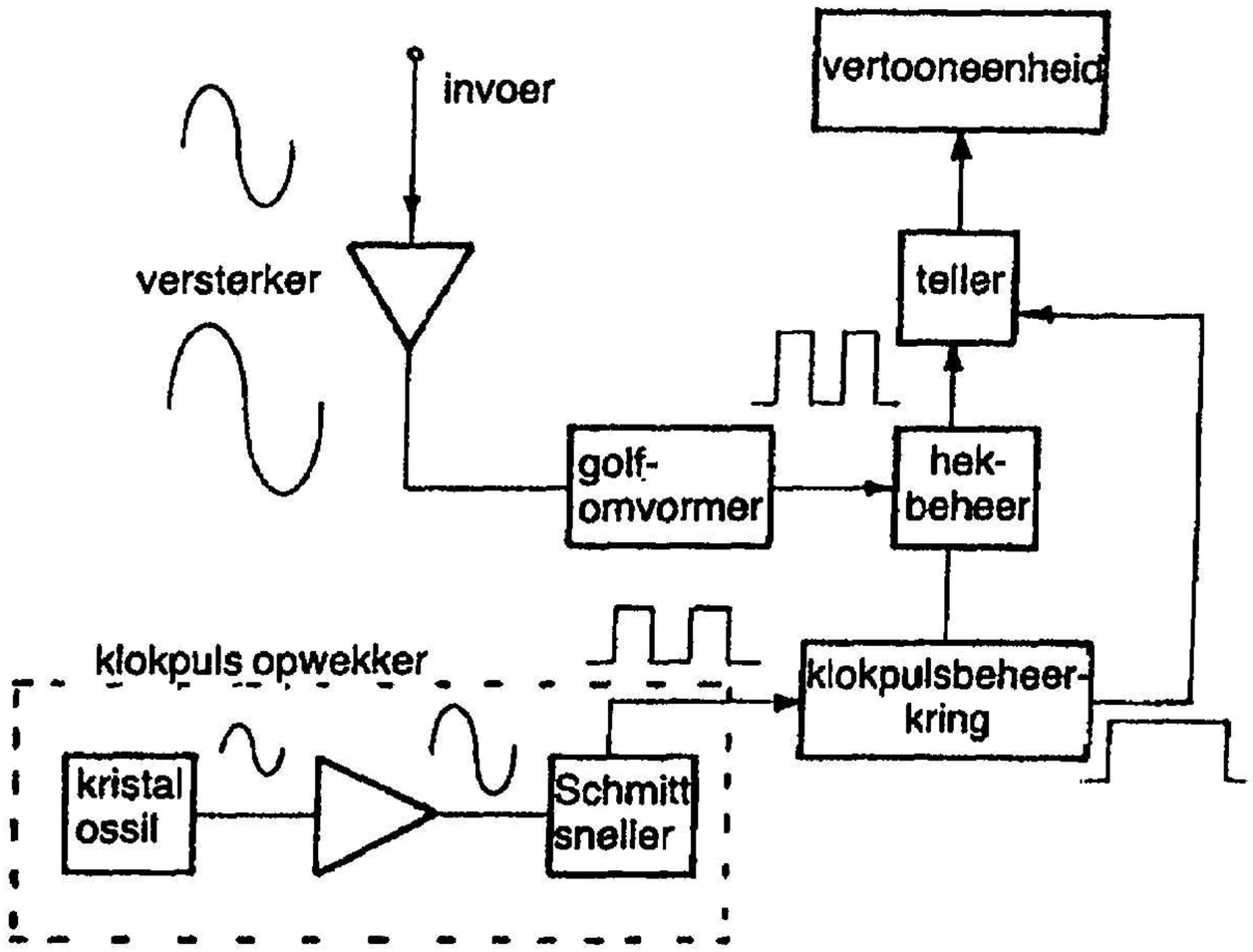
$X = \overline{A}.\overline{B}$

(8)
[30]

VRAAG 10
MEETINSTRUMENTE

10.1
A ± 98 V
B 9.5 mV of 0,0095 V
C 210 V
D 4 000 of 40 k
E 93 V (10)

10.2



(5)
[15]

VRAAG 11
VEILIGHEIDSMAATREËLS

11.1
* Speel of gekskeer
* Onveilige handelinge
* Onveilige toestande
* Gebrekkige kennis
* Versteurde geestelike toestande (ens.)

Enige reël
(4)

11.2
* Tel kop op
* Blaas 2 x saggies
* Druk op borskas
* Herhaal tot hulp kom.

of soortgelyk
(4)

11.3
* Trek handskoene aan
* Vermy aanraking met bloed.

(2)
[10]

TOTAAL: 300