POSSIBLE ANSWERS FOR:

ELECTRONICS SG
ELEKTRONIKA SG

TIME / *TYD*: 3 hours / *uur*

MARKS / *PUNTE* : 200

QUESTION 1 / *VRAAG 1*

1.1 1.1.1 (a) $X_C = \frac{1}{2\pi fc}$

$\therefore C = \frac{1}{2\pi X_C f}$

$= \frac{1}{2 \times 3{,}142 \times 50 \times 13}$

$= 244{,}854\mu F$

(b) $X_L = 2\pi fL$

$\therefore L = \frac{X_L}{2\pi F}$

$= \frac{18}{2 \times 3{,}142 \times 50}$

$= 57{,}296\ mH$

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

$= \sqrt{10^2 + (18-13)^2}$

$= \sqrt{10^2 + 5^2}$

$= 11{,}18\Omega$

$I = \frac{V}{Z}$

$= \frac{100}{11{,}18}$

$= 8{,}94A$

(d) (i) $V_R = IR$

$= 8{,}94 \times 10$

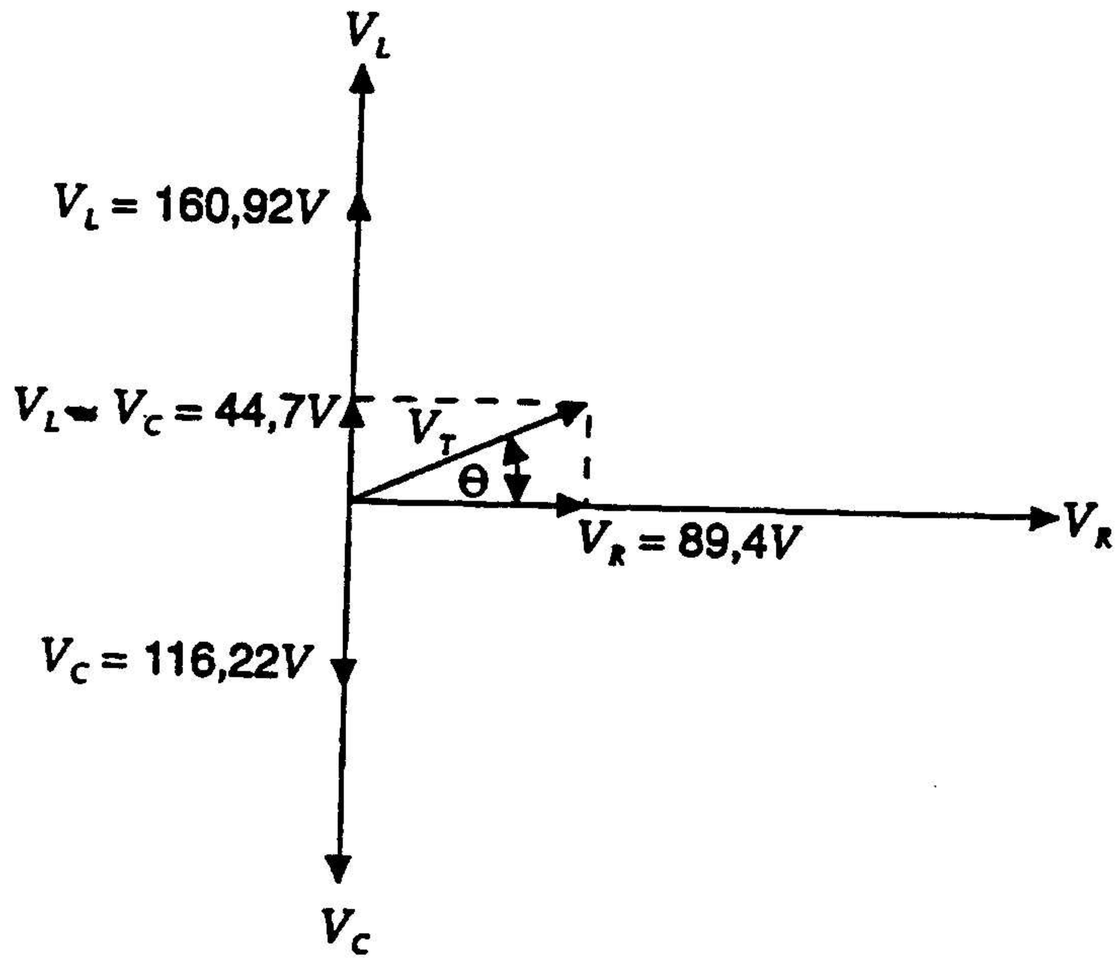
$= 89{,}4\ V$

(ii) $V_L = IX_L$

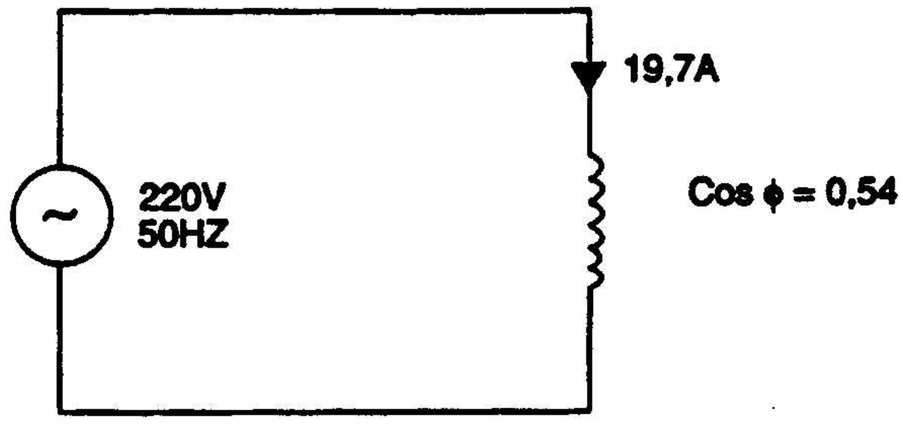
$= 8{,}94 \times 18$

$= 160{,}92\ V$

(iii) $V_C = IX_C$
$= 8{,}94 \times 13$
$= 116{,}22\ V$



1.2

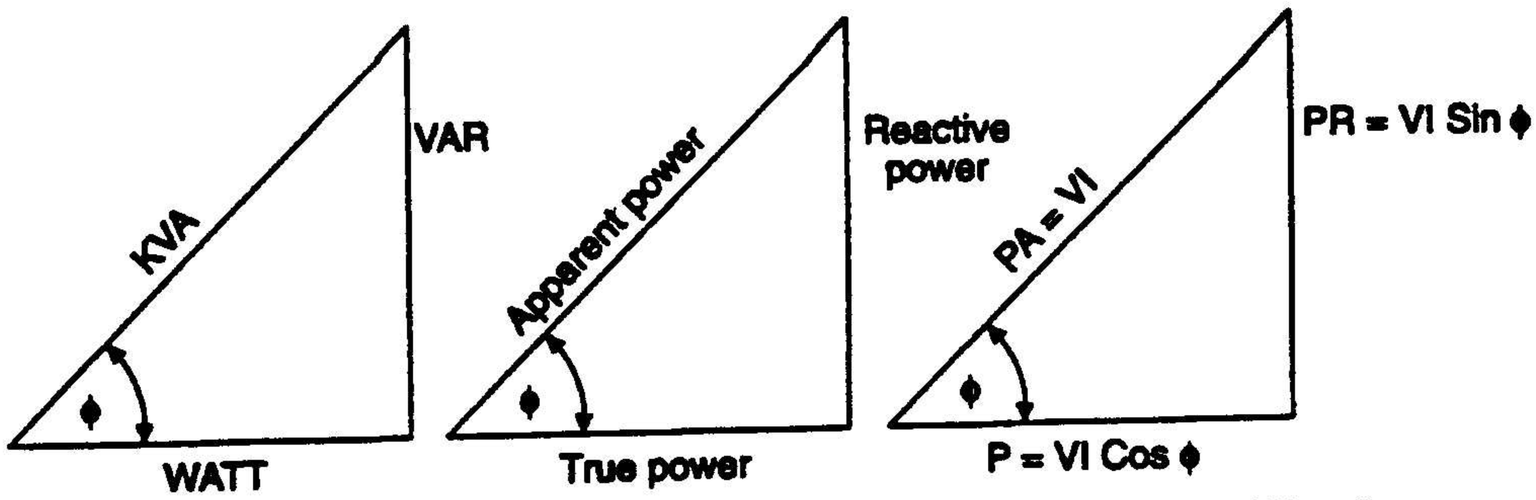


a) Apparent Power P_A = VI
= 220 x 19.7
= 4334VA
= 4.33kVA

b) True Power P_T = VI cosø
= 4.33 x 10^3 x 0.54
= 2.34kWatt

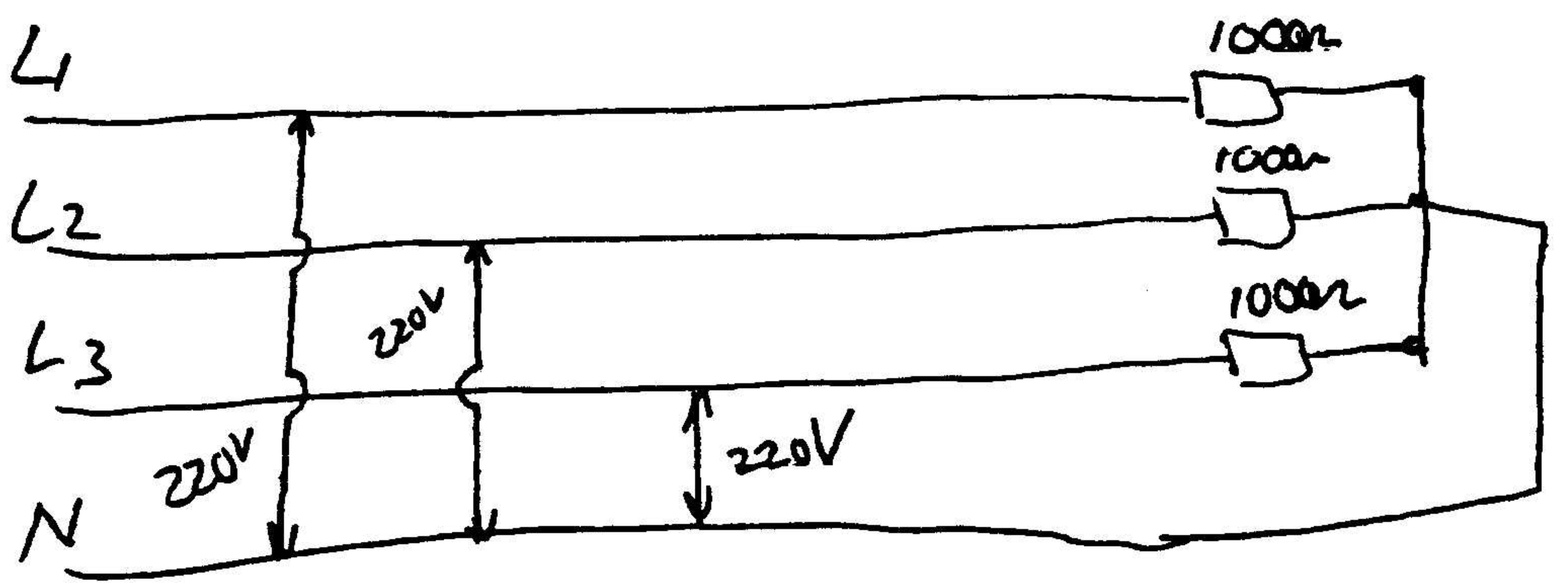
c) Reactive Power P_R = VI sinø
= 4334 x sin57.5
= 3655.26VAR
= 3.66kVAR

13 1



QUESTION 2 / *VRAAG 2*

2.1



(5)

2.1.1 (a) $V_L = \sqrt{3}\,V_p$

$= \sqrt{3}\ 220$

$=$ 381,05 Volt (3)

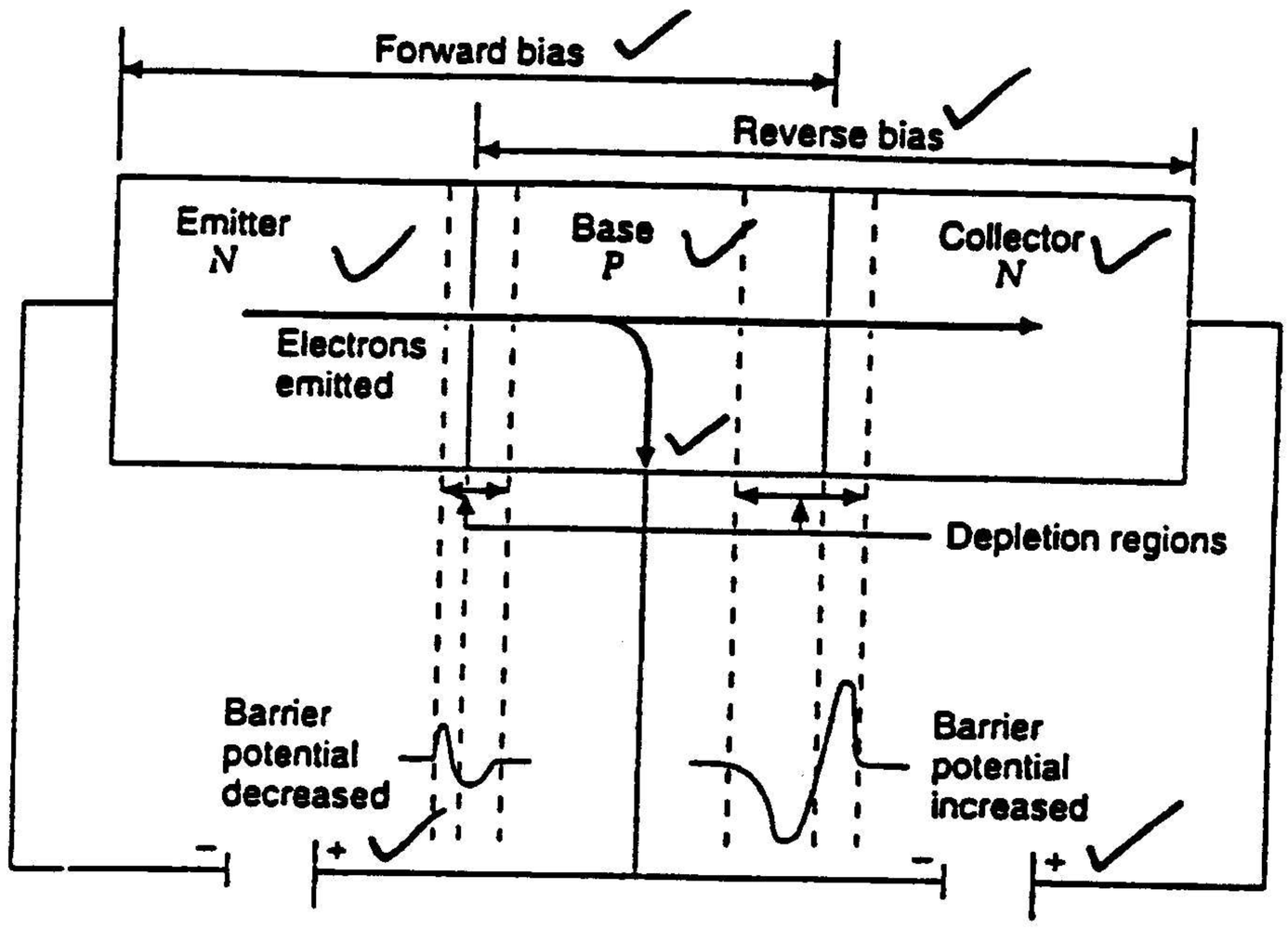
(b) $I_L = + I_P = \frac{V_P}{R} = \frac{220}{1000} =$ 0,22 Amp. (4)

[12]

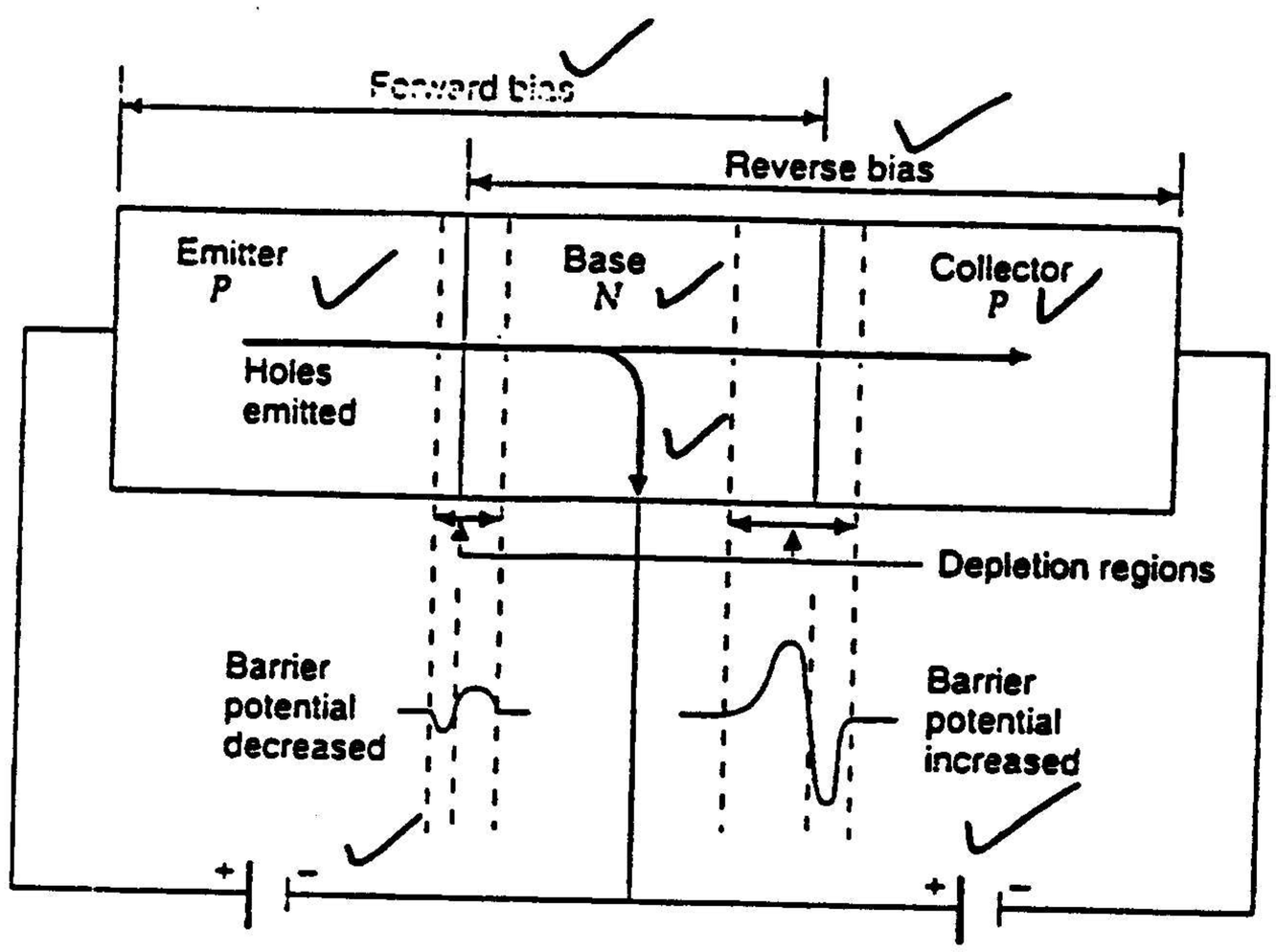
QUESTION 3 / *VRAAG 3*

3.1 3.1.1 221Ω Resistor
3.1.2 IN 4001 Diode
3.1.3 150Ω Resistor
3.1.4 PNP Transistor
3.1.5 250Ω Variable resistor

3.2



OR / *OF*



(8)

3.3

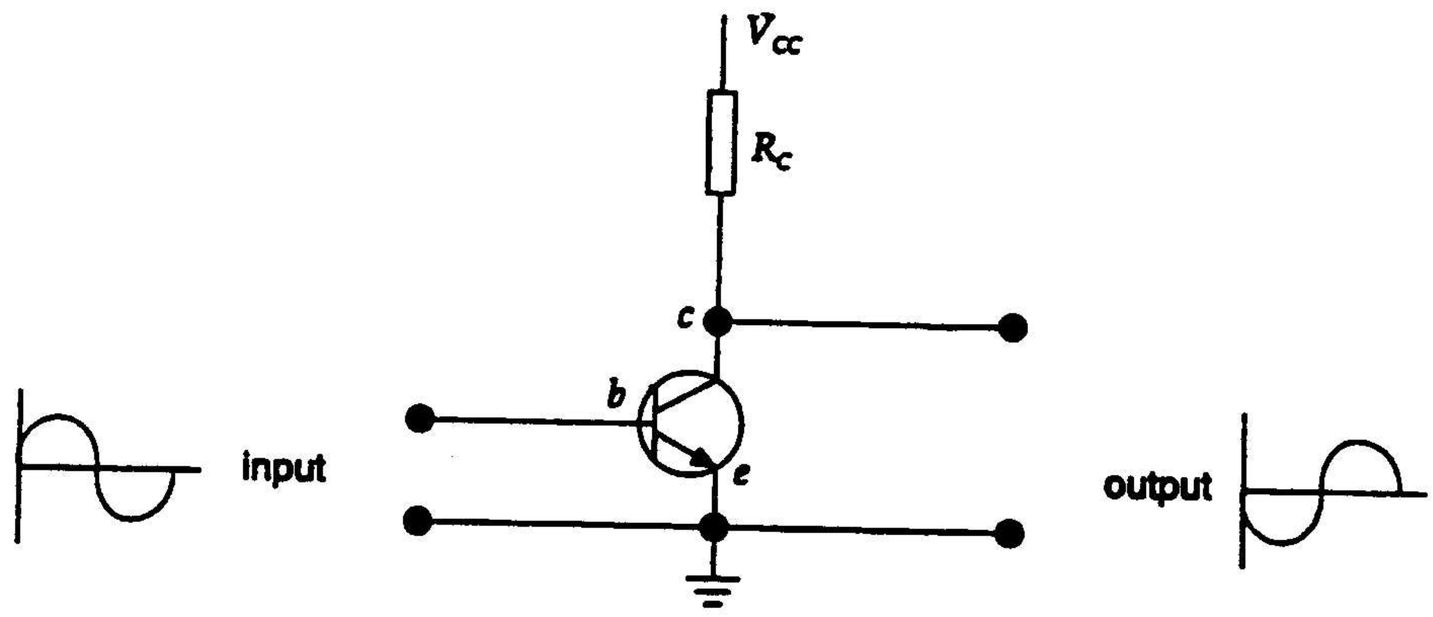


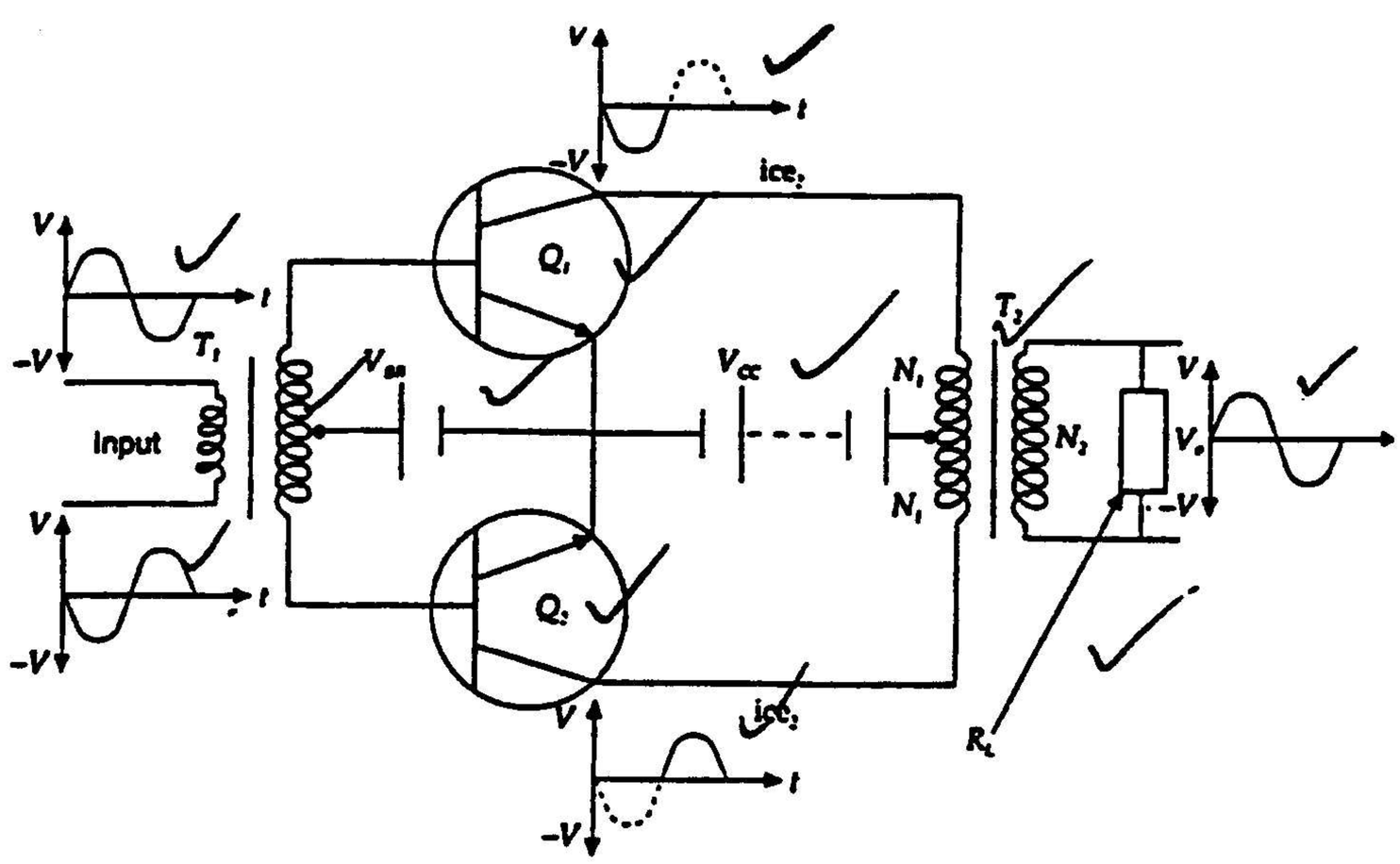
Figure 3.7 / *Figuur 3.7*
Properties of a transistor connected in the common emitter configuration

1

- the output is a 180° out of phase with the input
- high current amplification
- high voltage amplification
- high output impedance
- high input impedance

QUESTION 4 / *VRAAG 4*

4.1



Push-pull amplifier / *Balansversterker*

OPERATION:

Transistors Q1 and Q2 conduct when their base become positive with respect to their emitters.

Thus the transistor conduct one half cycle at a time.

The centre-trapped output transformer combines that two half-cycles to produce one complete cycle.

Vbb serves as the biasing voltage.

Vcc serves as the supply voltage.

Has a fixed gain.

WERKING:

Transistor Q1 and Q2 gelei wanneer hul onderskeie basis positief wotd ten opsigte van hul emitters.

Die transistors gelei dus een hald siklus om die beurt.

Die middeltrap-uitsettransformator kombineer die twee half suklusse om sodoende een kompleet uitset sein te verseker.

Vbb dien as voorspanning vir die transistor.

Vcc dien as die toevoerspanning.

Het 'n konstante wins.

(20)

4.2 OPERATION:

The quiescent point (!) is a cut-off.

Collector current flows for 180° (half of the input signal).

Amplifies only half of the input signal.

Improves efficiency.

WERKING:

Die Q punt is by die afsnypunt.

Kollektorstroom vloer vir 180° (slegs vir die helft3 van die insetsein).

Slegs een helfte van die insetsein word versterk.
Verbeterde doeltreffendheid.

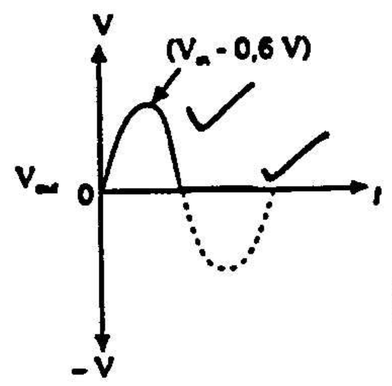
(10)
[30]

QUESTION 5 / *VRAAG 5*

5.1 Any ligical explanation / Enige aanvaarbare verduideliking. (15)

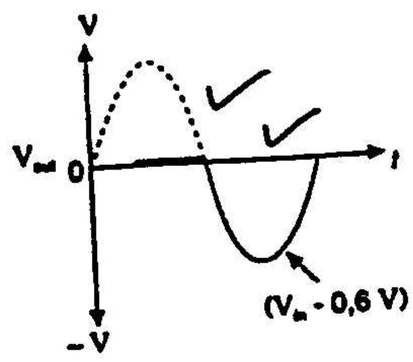
5.2

a)



(2)

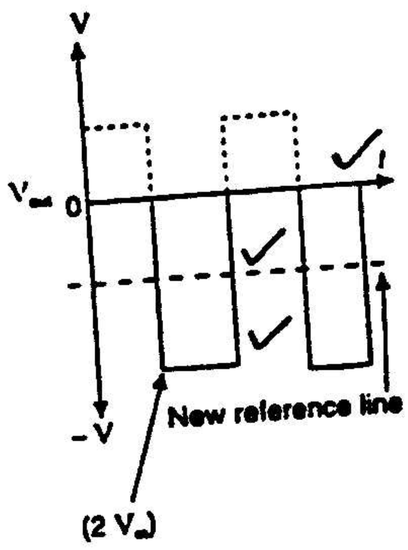
b)



(2)

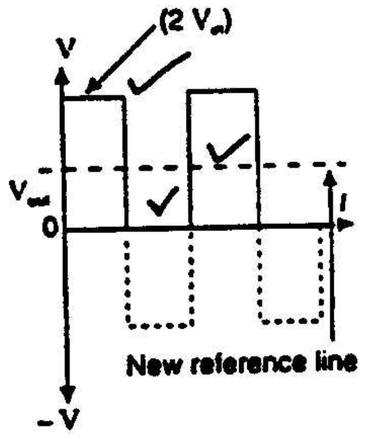
(10)

c)



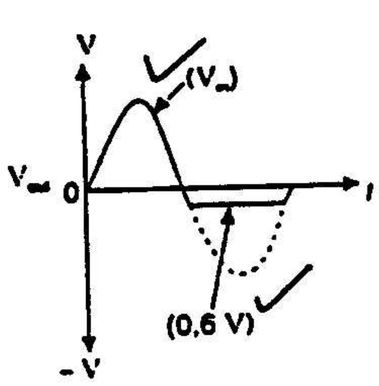
(3)

d)



(3)

e)

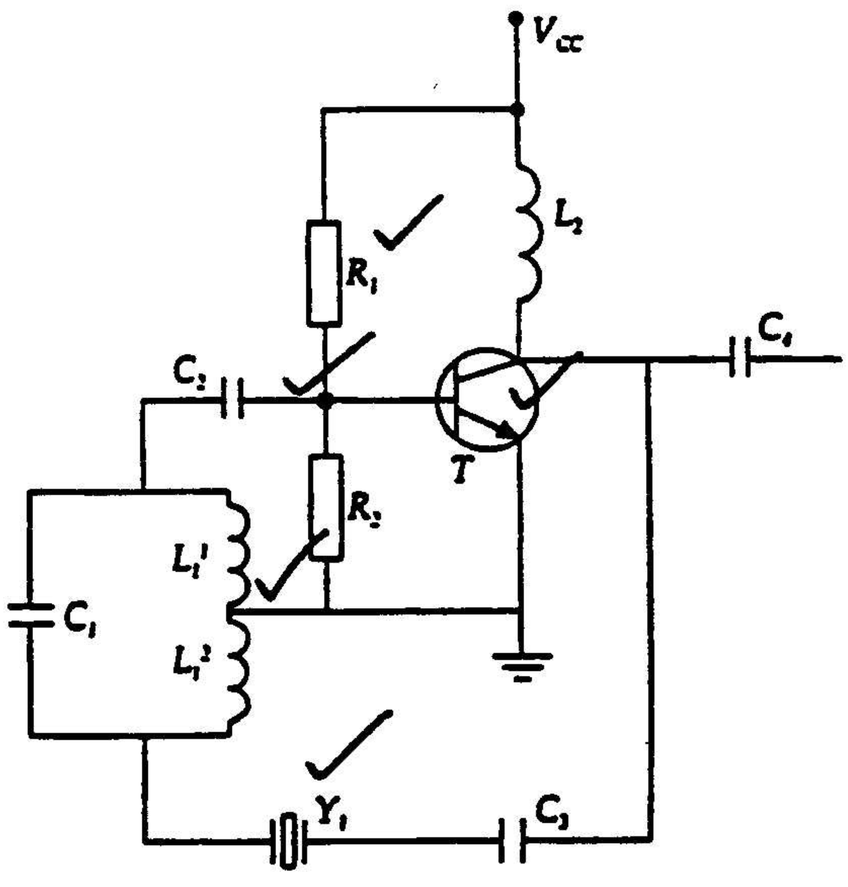


(2)

(12)

QUESTION 6 / *VRAAG 6*

6.1



CRYSTAL-CONTROLLED OSCILLATOR / *KRISTAL BEHEERDE OSSILATOR*

OPERATION:

Make use of a crystal to control the frequency of the oscillator.

The crystal is used to block low and high frequencies when its impedance is high.

When the frequency of the oscillator is equal to the natural frequency of the crystal, the impedance of the crystal is a minimum resulting in maximum feedback. (12)

WERKING:

Maak gebruik van 'n kristal om die frakwensie van die ossilator te beheer.

Die kristal word gebruik om lae en hoe frakwensies te blok wanneer die impedansie van die kristal verhoog word.

Wanneer die frekwensie van die ossilator gelyk is aan die natuurlike frakwensie van die ossilator, sal die impedansie van die kristal 'n minimum wees wat veroorsaak dat makisum terugvoer na die versterker plaasvind.

6.2 When pressure is applied to the crystal it has the ability to develop a potential difference across it. (2)

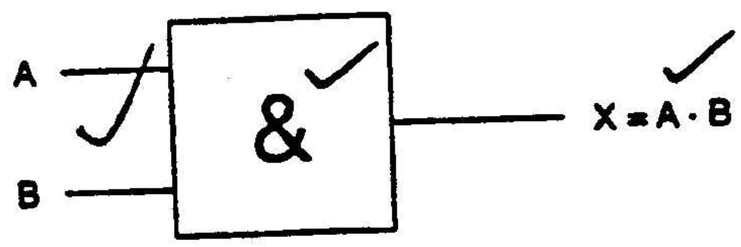
Wanneer drukking op die kristal toegepas word dat dit 'n potensiaal verskil oor die kristal veroorsaak.

[14]

QUESTION 7 / *VRAAG 7*

7.1 7.1.1

A	B	X
0	0	0 ✓
0	1	0 ✓
1	0	0 ✓
1	1	1 ✓

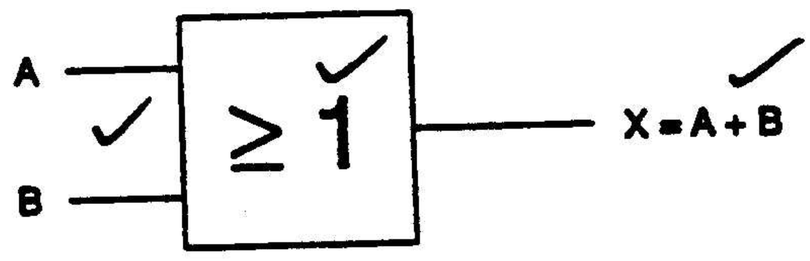


(7)

AND GATE / EN-HEK

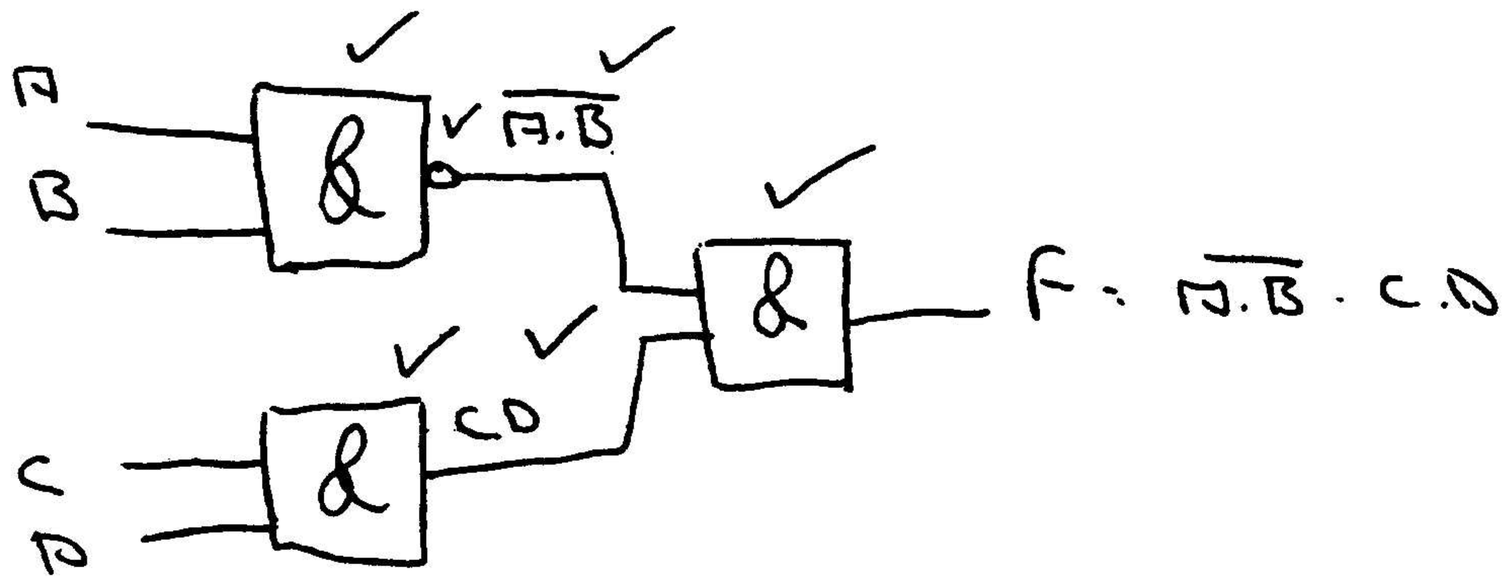
7.1.2

A	B	X
0	0	0 ✓
0	1	1 ✓
1	0	1 ✓
1	1	1 ✓



(7)

7.2



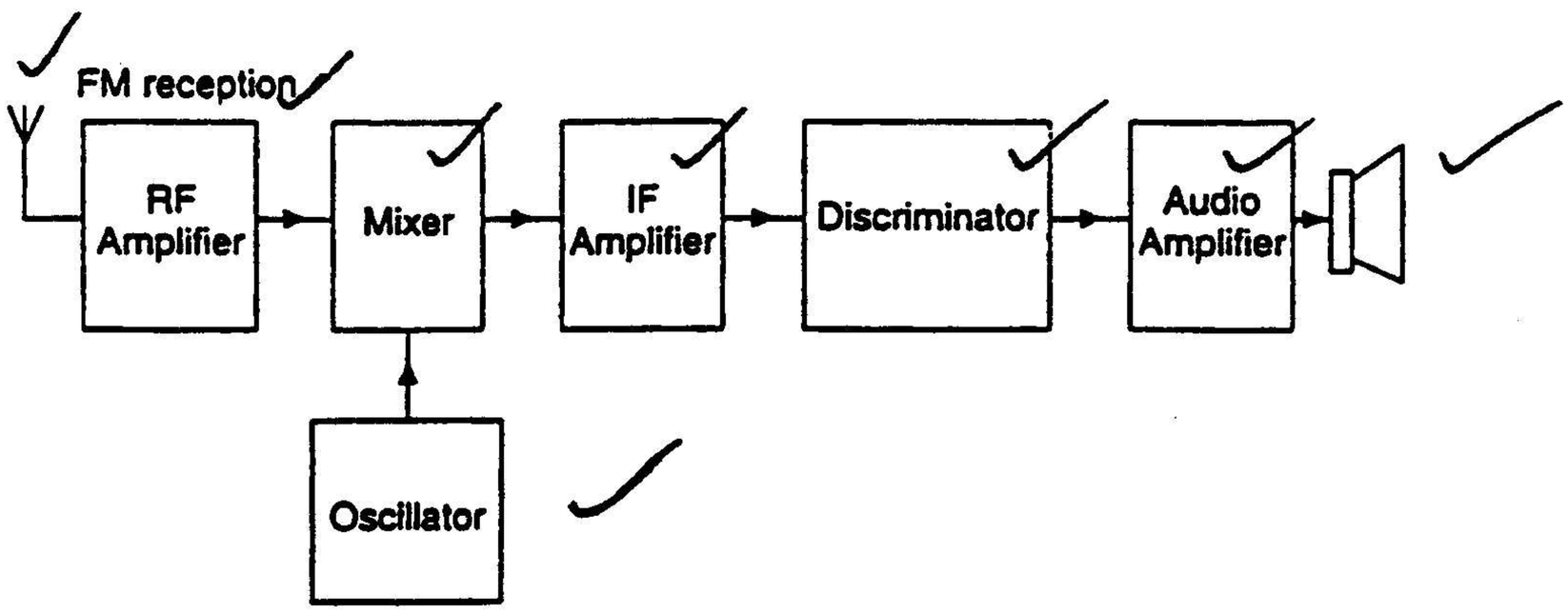
(6)

7.3

S1	S2	LED1	S1	S2	LED1
Open	Open	On	0	0	1
Closed	Open	On	1	0	1
Open	Closed	On	0	1	1
Closed	Closed	Off	1	1	0

(4)

8.1



FM RECEIVER / *FM ONTVANGER*

ANTENNA

Receive electromagnetic waves and transforms then into RF signals.

OSCILLATOR

Generates a additional RF signal to the mixer in such a way that the frequency output will be 10,7 MHz lower than the RF wave signal.

MIXER

The output of the RF amplifier and oscillator are applied to the mixer to give a RF signal of 10,7 MHz which is the difference of the two input signals.

ANTENNA

Skakel die elektromagnetiese golwe om na 'n RF sein.

OSSILLATOR

Verskaf 'n tweede RF sein aan die menger met 'n frekwensiewaarde van 10,7 MHz laer as die verkose RF sein.

MENGER

Die uitsette van die RF versterker en ossillator word gemeng om sein van 10,7 MHz te verskaf wat die verskil tussen die twee insetfrekwensies is.

QUESTION 9 / *VRAAG 9*

9.1 You van get AIDS from:

- Having unprotected six with an infected person
- Sharing a needle for intravenous drugs use with an HIV-inflected person.
- Infected blood entering the body through broken skin.
- From an infected mother to an unborn child. (4)

9.2 Any acceptable answer
Enige aanvaarbare antwoord.