

**GAUTENG DEPARTMENT OF EDUCATION
GAUTENGSE DEPARTEMENT VAN ONDERWYS
SENIOR CERTIFICATE EXAMINATION
SENIORSERTIFIKAAT-EKSAMEN**

**ELECTRONICS SG
ELEKTRONIKA SG**

**Possible Answers / Moontlike Antwoorde
Feb / Mar / Maart 2006**

QUESTION/VRAAG1

ELECTRIC CURRENT THEORY/ELEKTRIESE STROOMTEORIE

$$\begin{array}{ll}
 1.1 & 1.1.1 \quad X_L = 2\pi FL \\
 & \quad = 2 \times \pi \times 50 \times 175 \times 10^{-3} \\
 & \quad = 54,978 \text{ O} \qquad \qquad \qquad (3)
 \end{array}$$

$$\begin{array}{ll}
 & X_C = \frac{1}{2\pi fC} \\
 1.1.2 & \quad = \frac{1}{2 \times \pi \times 50 \times 75 \times 10^{-6}} \\
 & \quad = 42,445 \text{ O} \qquad \qquad \qquad (3)
 \end{array}$$

$$\begin{array}{ll}
 1.1.3 & Z = \sqrt{R^2 + (X_L - X_C)^2} \\
 & \quad = \sqrt{12^2 + (54,978 - 42,445)^2} \\
 & \quad = 17,352 \text{ O} \qquad \qquad \qquad (3)
 \end{array}$$

$$\begin{array}{ll}
 1.1.4 & I_T = \frac{V_T}{Z} \\
 & \quad = \frac{240}{17,35} \\
 & \quad = 13,83 \text{ A} \qquad \qquad \qquad (3)
 \end{array}$$

$$\begin{array}{ll}
 1.1.5 & \cos\Phi = \frac{R}{Z} \\
 & \quad = \frac{12}{17,356} \\
 & \quad = 0,69 \\
 & \cos\Phi = 0,69 \\
 & \quad ? = 46,26^\circ \qquad \qquad \qquad (3)
 \end{array}$$

$$\begin{aligned}
 & P = V \times I \times \cos \varphi \\
 1.1.6 \quad & = 240 \times 13,83 \times 0,69 \\
 & = 2,290 \text{ kW} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 & X_L = 2 \pi f L \\
 1.2 \quad 1.2.1 \quad & = 2 \times \pi \times 50 \times 0,3 \\
 & = 94,25 \text{ } \Omega \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 & X_C = \frac{1}{2 \pi f C} \\
 & = \frac{1}{2 \times \pi \times 50 \times 150 \times 10^{-6}} \\
 & = 21,22 \text{ } \Omega \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 & I_R = \frac{V}{R} \\
 & = \frac{250}{45} \\
 & = 5,55 \text{ A} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 & I_L = \frac{V}{X_L} \\
 & = \frac{250}{94,25} \\
 & = 2,65 \text{ A} \quad (3)
 \end{aligned}$$

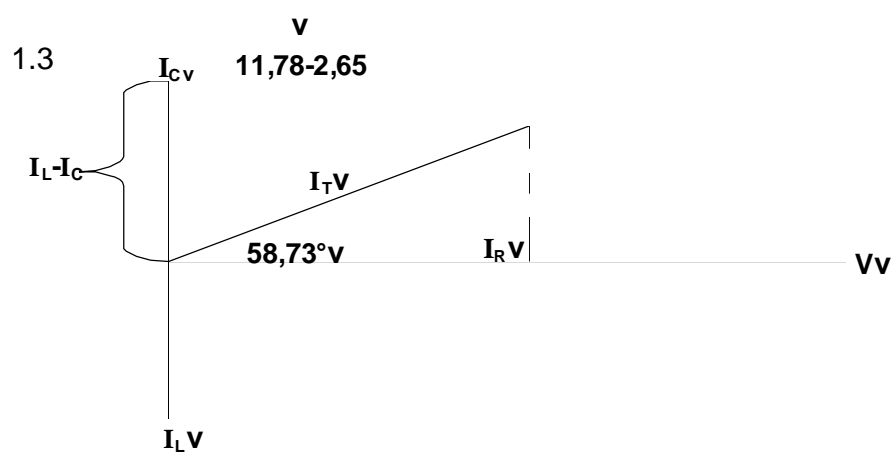
$$\begin{aligned}
 & I_C = \frac{V}{X_C} \\
 & = \frac{250}{21,22} \\
 & = 11,78 \text{ A} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 & I_T = \sqrt{I_R^2 + (I_C - I_L)^2} \\
 1.2 \quad 1.2.2 \quad & = \sqrt{5,55^2 + (11,78 - 2,65)^2} \\
 & = \sqrt{5,55^2 + 9,132} \\
 & = 10,685 \text{ A} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 & Z_d = \frac{L}{R_C} \\
 1.2.3 \quad & = \frac{0,3}{45 \times 150 \times 10^{-6}} \\
 & = 44,44 \text{ } \Omega \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 \cos \phi &= \frac{I_R}{I_T} \\
 &= \frac{5,55}{10,685} \\
 1.2.4 \quad &= 0,519 \\
 \phi &= \cos^{-1} 0,519 \\
 &= 58,73^\circ
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 1.2.5 \quad Q &= \frac{I}{R} \sqrt{\frac{L}{C}} = \frac{1}{45} \sqrt{\frac{0,3}{150 \times 10^{-6}}} \\
 &=
 \end{aligned} \tag{3}$$

(7)
[52]**QUESTION/VRAAG 2****THREE-PHASE ALTERNATING CURRENT SYSTEMS
DRIEFASIGE WISSELSTROOM-STELSELS**

$$\begin{aligned}
 V_L &= \sqrt{3} V_p \\
 2.1 \quad 2.1.1 \quad V_p &= \frac{V_L}{\sqrt{3}} \\
 &= \frac{380}{\sqrt{3}} \\
 &= 219,393 \text{ V}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 2.1.2 \quad I_L &= I_p \\
 2.1.2 \quad I_L &= \frac{E_p}{Z_p} \\
 &= \frac{219,393}{50} \\
 &= 4,388 \text{ A}
 \end{aligned} \tag{3}$$

$$2.1.3 \quad \begin{aligned} I_L &= I_p \\ I_p &= 4,388 \text{ A} \end{aligned} \quad (1)$$

2.2 In delta/in delta

$$2.2.1 \quad \begin{aligned} V_L &= V_p \\ V_p &= 380 \text{ V} \end{aligned} \quad (1)$$

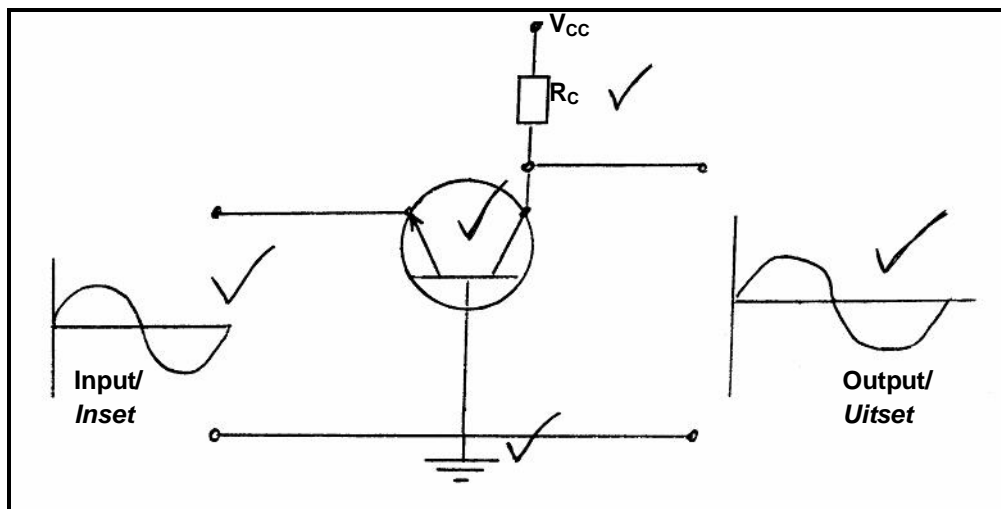
$$2.2.2 \quad \begin{aligned} I_L &= \sqrt{3} \times I_p \\ I_p &= \frac{E_p}{Z_p} \\ 2.2.2 \quad &= \frac{380}{50} \\ &= 7,6 \text{ A} \end{aligned} \quad (3)$$

$$2.2.3 \quad \begin{aligned} I_L &= \sqrt{3} \times I_p \\ &= \sqrt{3} \times 7,6 \\ &= 13,164 \text{ A} \end{aligned} \quad (3)$$

[14]

QUESTION/ VRAAG 3 SEMICONDUCTORS / HALFGELEIERS

3.1

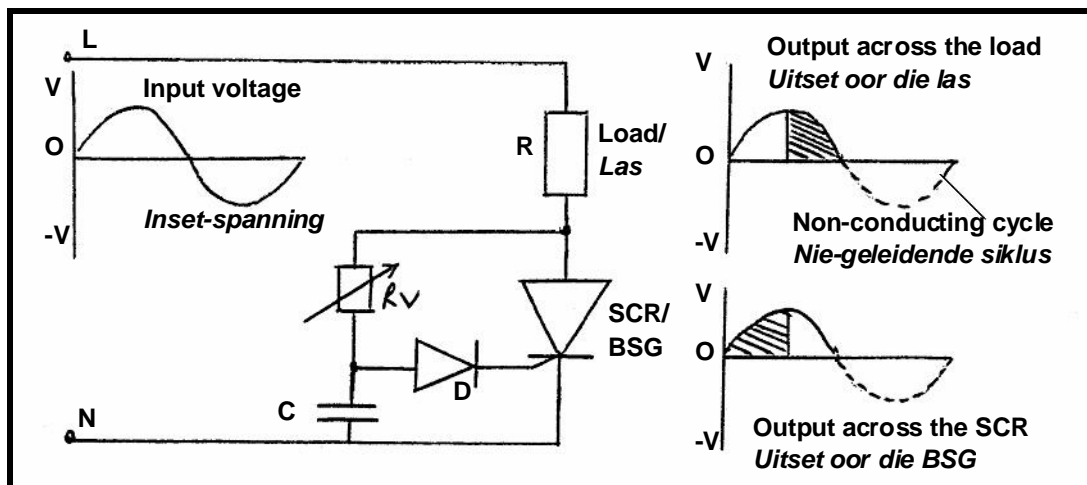


(6)

- The output signal is in phase with the input/*Die inset-sein is in fase met die uitset-sein*
- The current amplification is low (gain ± 1)/*Stroomversterking laag (wins ± 1)*
- The voltage amplification is high/*Hoë spanningversterking*
- High output impedance/*Hoë uitset-impedansie*
- Low input impedance/*Lae inset-impedansie*

(Four only/Slegs vier) (4)

3.2



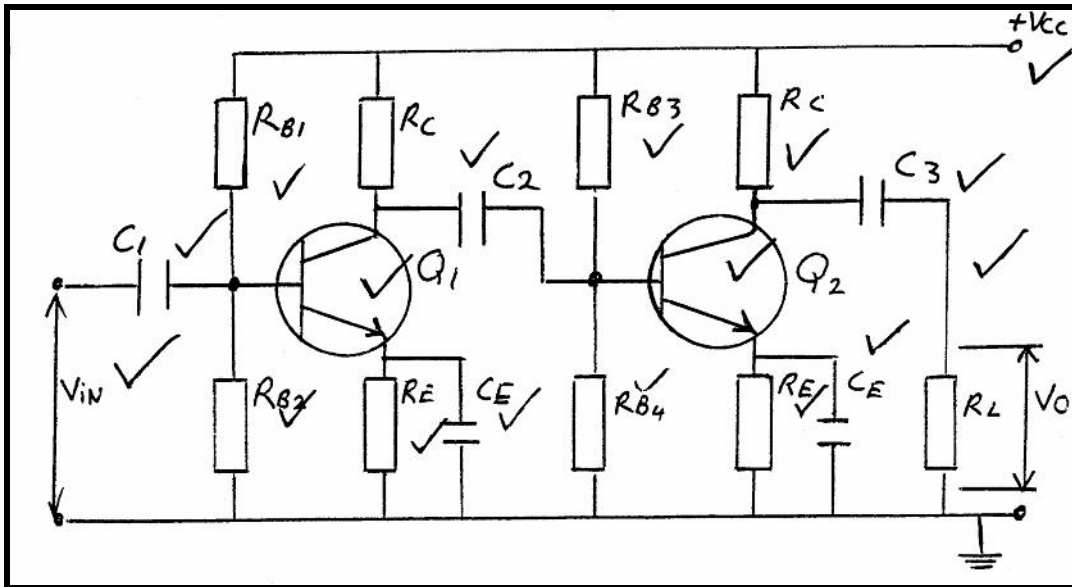
(8)

- 3.3
- i) In the PNP transistor, the N-material is sandwiched between two P-materials.
By die PNP-transistor, is die N-tipe materiaal tussen die twee P-tipe materiale geleë.
 - ii) In the NPN type, the P-material is sandwiched between two N-materials
By die NPN-tipe, is die P-materiaal tussen die twee N-materiale geleë.
 - iii) In PNP, the majority carriers are holes.
By PNP is die meerderheidsdraers holtes.
 - iv) In NPN, the majority carriers are electrons.
By NPN, is die meerderheidsdraers elektrone.
 - v) For a transistor to operate as an amplifier, it must be forward-biased on the base-emitter junction and the base-collector reverse-biased.
Vir die transistor om te kan werk as ? versterker, moet die basis-emittor mee-voorgespan wees en die basis-kollektor teen-voorgespan wees.
 - vi) The polarity is opposite in the two transistors.
Die polariteit is teenoorgesteld by die twee transistors.

(6)
[24]

QUESTION / VRAAG 4
AMPLIFIERS / VERSTERKERS

4.1



(17)

$$I_c = \frac{V_{cc}}{R_c}$$

$$= \frac{15}{3 \times 10^3}$$

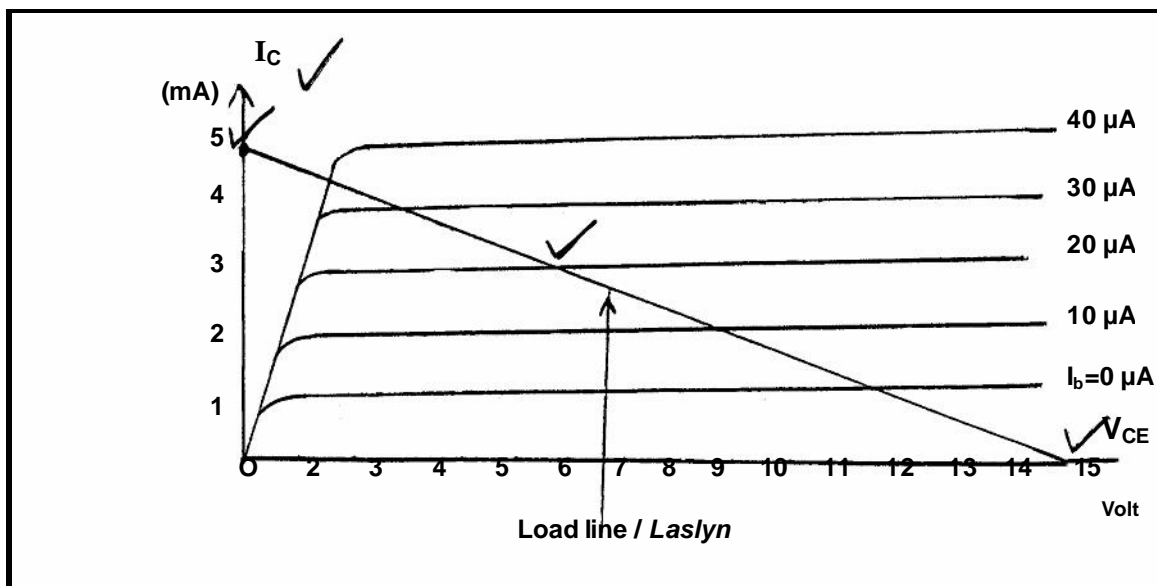
$$= 5 \text{ mA}$$

4.2

$$V_{cc} = V_{ce}$$

$$\therefore V_{ce} = 15 \text{ V}$$

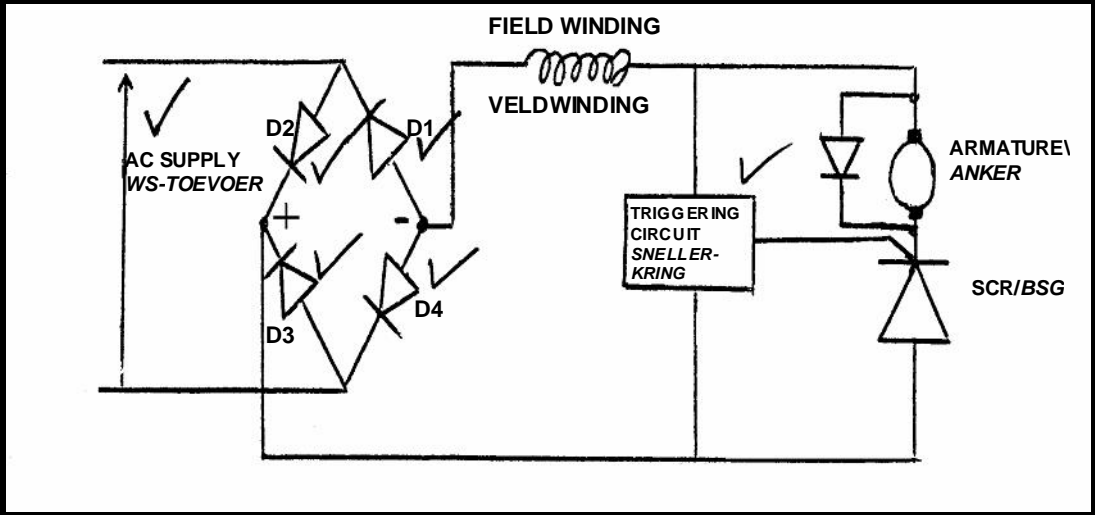
(11)



[28]

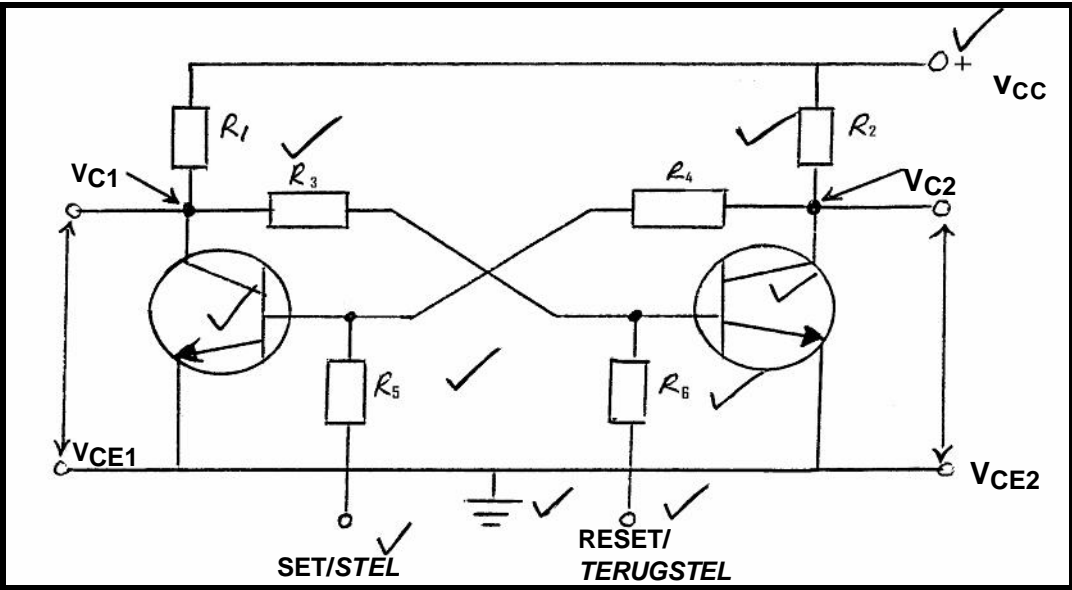
QUESTION / VRAAG 5
SWITCHING AND CONTROL CIRCUITS / SKAKEL- EN BEHEERKRINGE

5.1



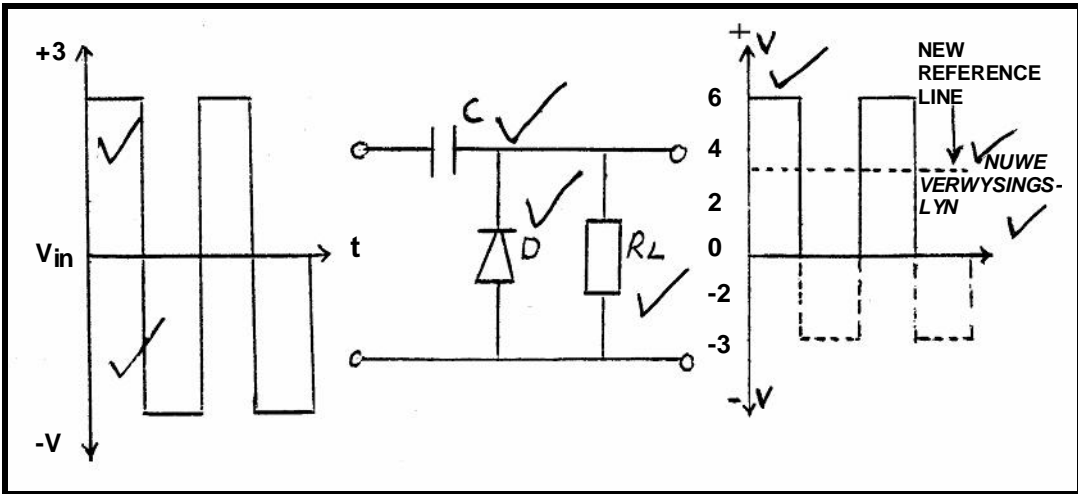
(10)

5.2



(10)

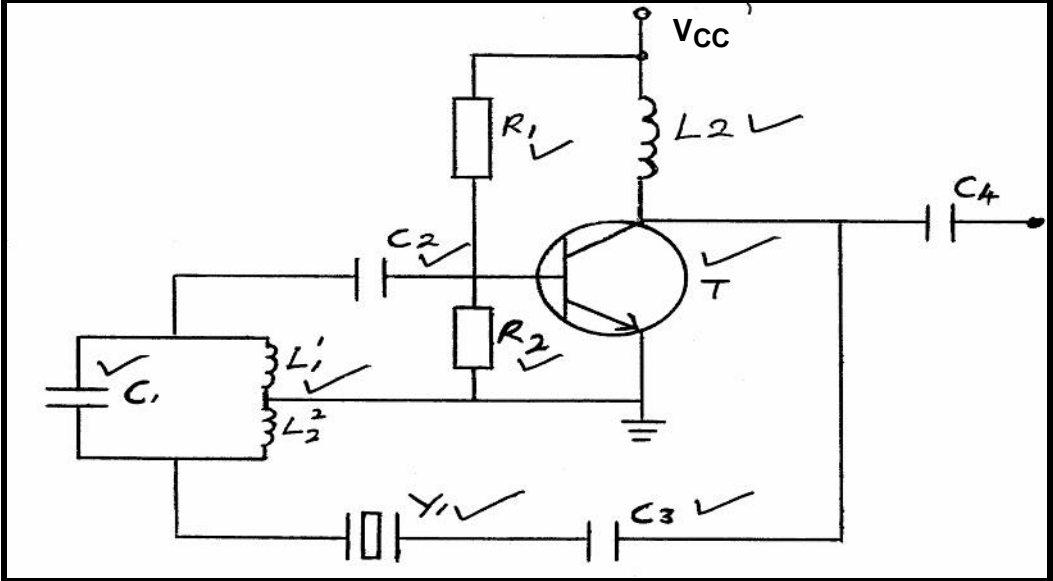
5.3



(8)
[28]

QUESTION / VRAAG 6
OSCILLATORS / OSSILLATORS

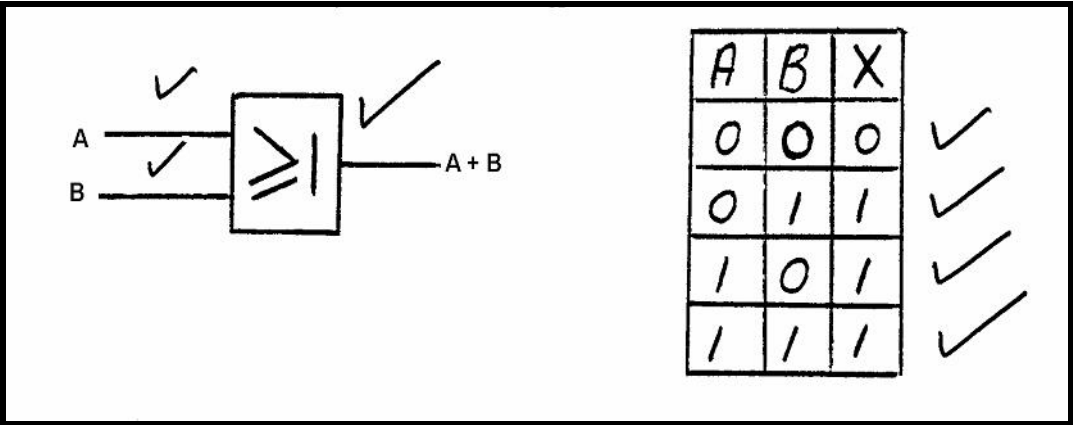
6.1



(10)
[10]

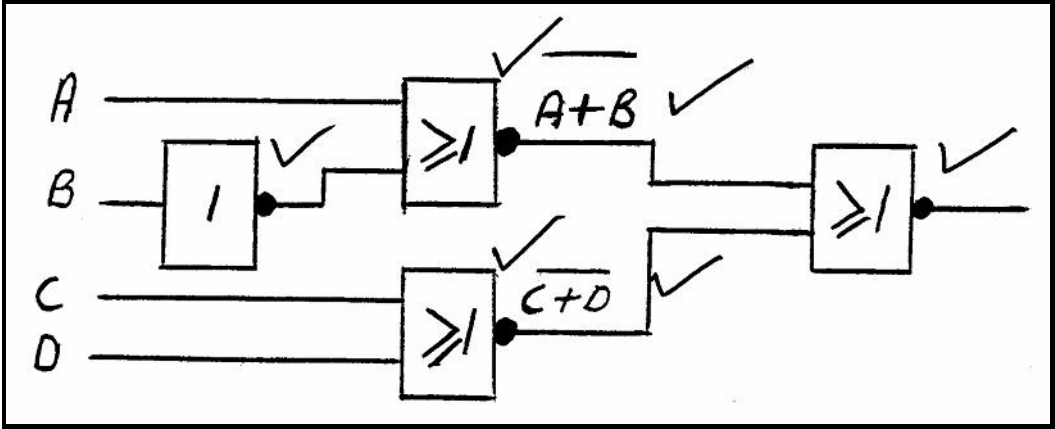
QUESTION/VRAAG 7
COMPUTER PRINCIPLES / REKENAARBEGINSELS

7.1



(7)

7.2



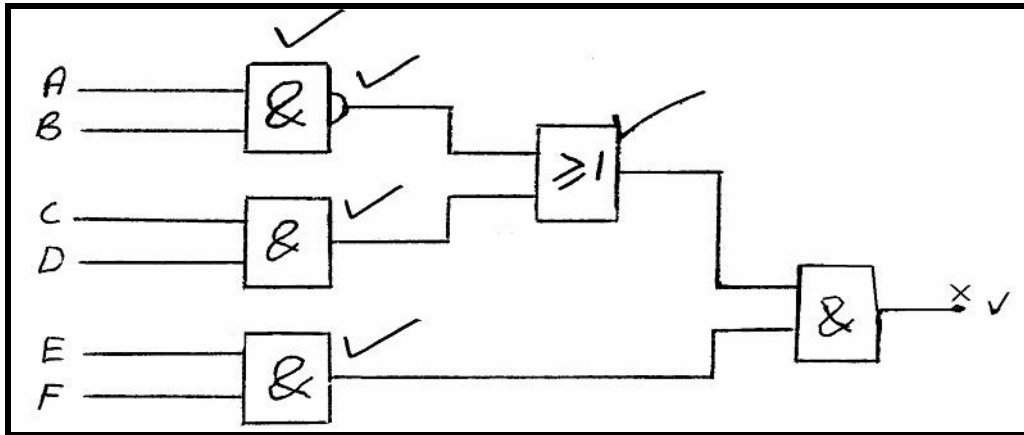
(6)

7.3

$$\begin{aligned}
 (X + Y)(X + Z) &= X + YZ \\
 X.Xv + XZ + XY + YZ &= X + YZ \\
 Xv + XZ + Y(X + Z) &= X + YZ \\
 X(1 + Z) v + XY + YZ &= X + YZ \\
 Xv + XY + YZ &= X + YZ \\
 X(1 + Y) v + YZ &= X + YZ \\
 Xv + YZ &= X + YZ
 \end{aligned}$$

(6)

7.4



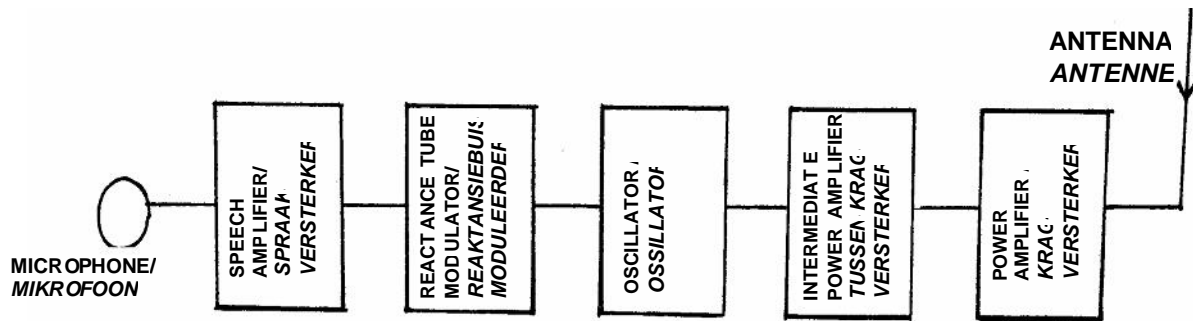
(7)

7.5 $A.B(C.\bar{D} + E.F)$

(6)
[32]

QUESTION / VRAAG 8
ELECTRONIC DEVICES / ELEKTRONIESE TOESTELLE

8.1



[7]

QUESTION / VRAAG 9
OCCUPATIONAL SAFETY MEASURES / BEROEPSVEILIGHEID-MAATREËLS

- 9.1 i) Keep latex gloves in stock./*Hou lateks-handskoene in voorraad.*
- ii) Avoid any sharp materials and objects, throw them away./
Vermy alle skerp materiale en voorwerpe. Raak ontslae van dit.
- iii) Be careful of any blood./*Wees versigtig vir enige bloed.*
(Any other suitable answer/Enige ander geskikte antwoord) (2)
- 9.2 i) Horseplay is dangerous and causes many accidents./
Spelery is gevaarlik en veroorsaak ongelukke.
- ii) An untidy workshop, workbench or surroundings often causes accidents./
 ? Onnet werkswinkel, -bank of -omgewing veroorsaak dikwels ongelukke.
- iii) Spares and equipment must be stacked and arranged in such a manner
 that people will not trip over them or be injured by protruding parts./
*Onderdele en toerusting moet so gerangskik en gepak word dat mense nie
 daaroor kan struikel en beseer word deur dele wat uitsteek nie.*
- iv) Wide enough walkways should be left in between.
Loopgange moet wyd genoeg wees.
- v) Floors should not have a slippery surface and must be kept clean and free
 of slippery substances./
*Vloere moet nie glad wees nie en moet skoon gehou word van stowwe wat
 mens kan laat gly.* ANY THREE/ENIGE DRIE (3)
[5]

TOTAL/TOTAAL: 200