higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

KOMMUNIKASIE-ELEKTRONIKA N6

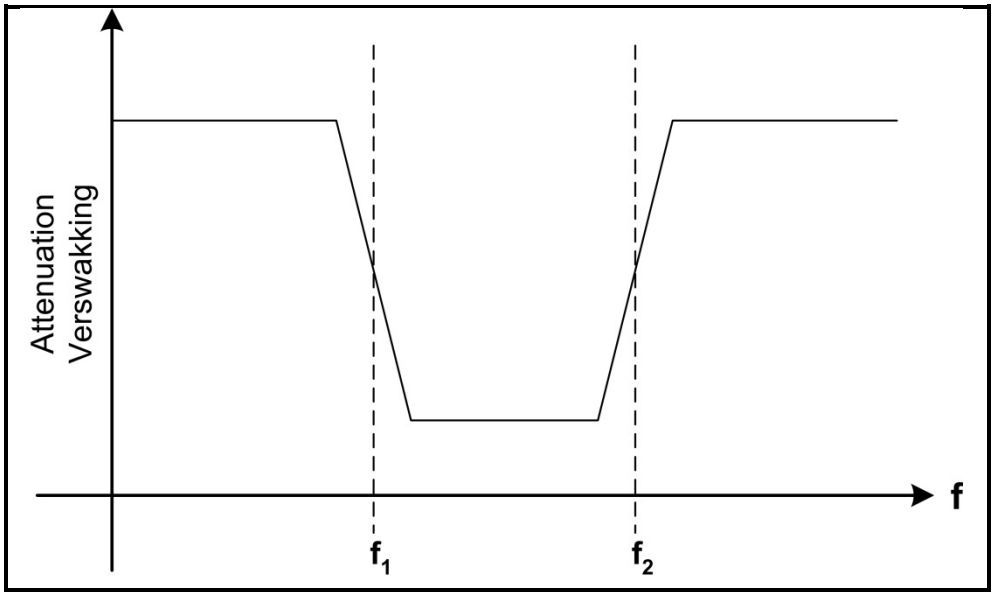
7 AUGUSTUS 2019

Hierdie nasienriglyn bestaan uit 12 bladsye.

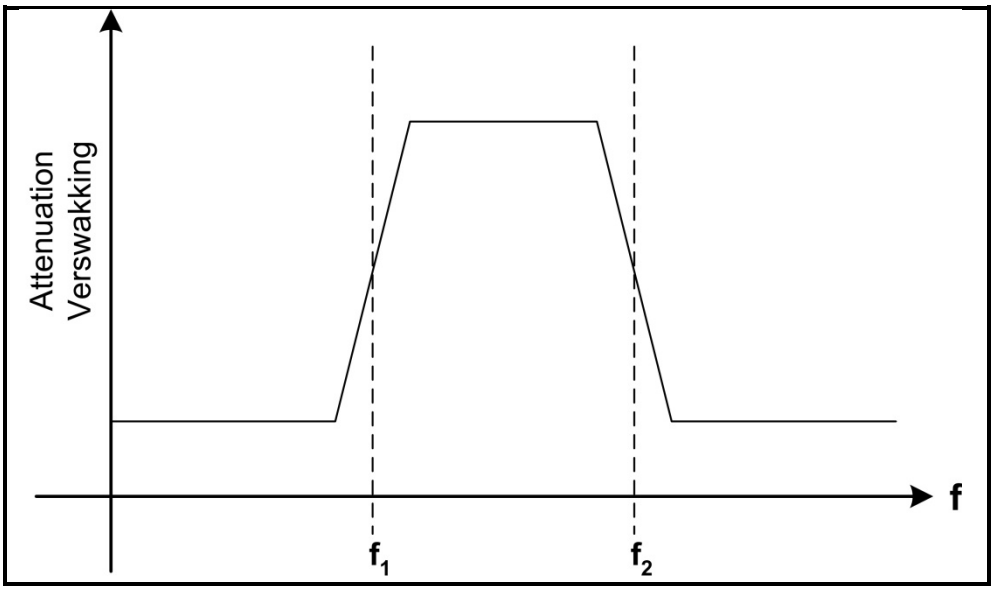
Kopiereg voorbehou

VRAAG 1

1.1 1.1.1



1.1.2



(2 × 2) (4)

1.2 $L = \frac{Z_o}{4.\pi.f_c}$ $C = \frac{1}{4.\pi.Z_o.f_c}$

$= \frac{600}{4 \times 3,142 \times 5 \times 10^3}$ $= \frac{1}{4 \times 3,142 \times 600 \times 5 \times 10^3}$

= 9,548 mH **= 26,522 nF** (2)

$m = \sqrt{1 - \frac{f_\infty{}^2}{f_c{}^2}}$ Series C $= \frac{C}{m}$

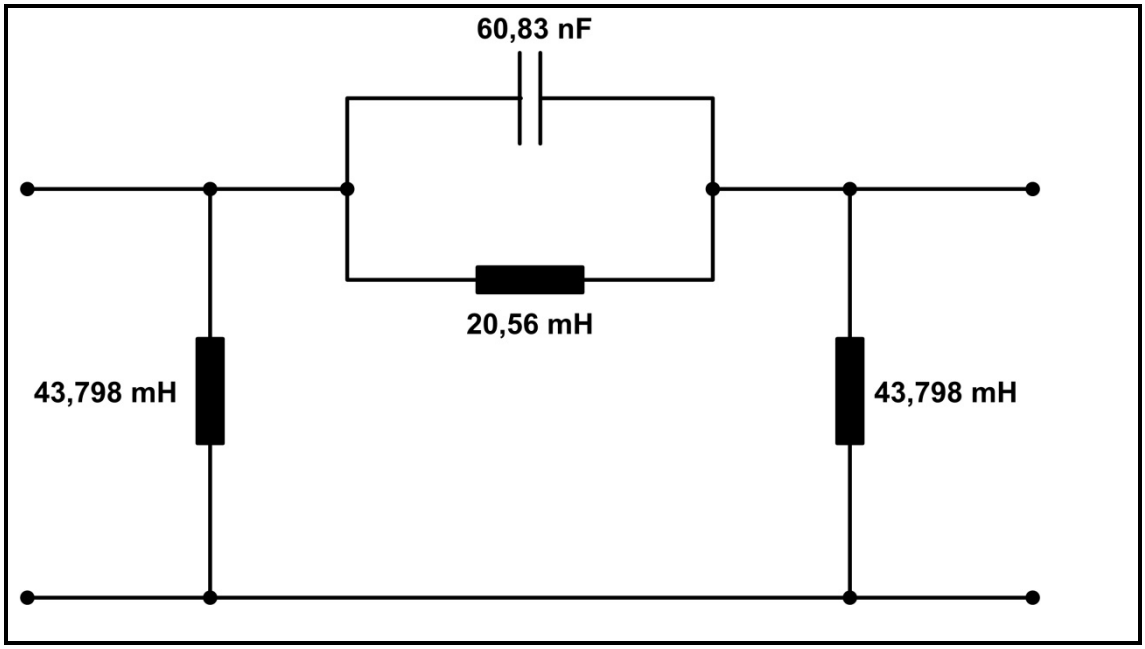
$= \sqrt{1 - \frac{\left(4,5 \times 10^3\right)^2}{\left(5 \times 10^3\right)^2}}$ $= \frac{26,522 \times 10^{-9}}{0,436}$

= 0,436 **= 60,83 nF** (2)

Series L $= \frac{4m}{1 - m^2} \cdot L$ Shunt L $= \frac{2.L}{m}$

$= \frac{4 \times 0,436}{1 - 0,436^2} \times 9,548 \times 10^{-3}$ $= \frac{2 \times 9,548 \times 10^{-3}}{0,436}$

= 20,56 mH **= 43,798 mH** (2)



(1)

1.3 1.3.1 Inset
1.3.2 onder

(2 × 1) (2)

1.4 Sjunt C = m.C m = 0,6

$$\therefore C = \frac{\text{Shunt C}}{m}$$

$$= \frac{30 \times 10^{-9}}{0,6}$$

= 50 nF (2)

$$C = \frac{1}{\pi . Z_o . f_c}$$

$$\therefore f_C = \frac{1}{\pi . Z_o . C}$$

$$= \frac{1}{3,142 \times 600 \times 50 \times 10^{-9}}$$

= 10,609 kHz (2)
[17]

VRAAG 2

2.1 Nee, die verswakker se frekwensie is nie sensitief nie, want 'n verswakker bestaan net uit weerstandbiedende komponente wat nie frekwensiesensitief is nie. (3)

2.2 $dB = 20 \log N$

$$\therefore N = \text{antilog } \frac{dB}{20}$$

$$= \text{antilog } \frac{12}{20}$$

= 3,981 (2)

$$Z_1 = R_1\left[\frac{N^2+1}{N^2-1}\right] - 2\sqrt{R_1.R_2}\left[\frac{N}{N^2-1}\right]$$

$$= 480\left[\frac{3,981^2+1}{3,981^2-1}\right] - 2\sqrt{480 \times 420}\left[\frac{3,981}{3,981^2-1}\right]$$

= 303,891 Ω (1)

$$Z_2 = 2\sqrt{R_1.R_2}\left[\frac{N}{N^2-1}\right]$$

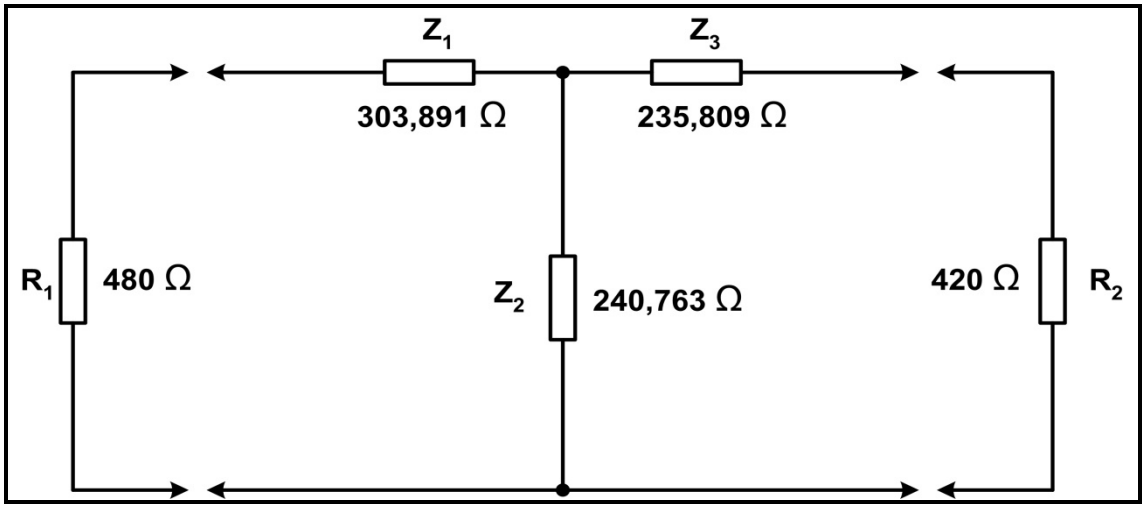
$$= 2\sqrt{480\times420}\left[\frac{3,981}{3,981^2-1}\right]$$

$$= \mathbf{240,763\ \Omega} \quad (1)$$

$$Z_3 = R_2\left[\frac{N^2+1}{N^2-1}\right] - 2\sqrt{R_1.R_2}\left[\frac{N}{N^2-1}\right]$$

$$= 420\left[\frac{3,981^2+1}{3,981^2-1}\right] - 2\sqrt{480\times420}\left[\frac{3,981}{3,981^2-1}\right]$$

$$= \mathbf{235,809\ \Omega} \quad (1)$$



(2)

2.3

$$Z_B = \frac{\sqrt{R_1.R_2}}{2}\ .\ \left[\frac{N^2-1}{N}\right]$$

$$2\,Z_B = \sqrt{R_1.R_2}\ .\ \left[\frac{N^2-1}{N}\right]$$

$$8\times10^3 = \sqrt{300\ .\ R_1}\ .\ \left[\frac{10^2-1}{10}\right]$$

$$8\times10^3 = \sqrt{300\ .\ R_1}\ \times\ [9,9]$$

$$\sqrt{300\ .\ R_1} = 808,081$$

$$300R_1 = 652,995\times10^3$$

$$\therefore\ \mathbf{R_1 = 2,177\ k\Omega} \quad (4)$$

2.4 **Vir 200 ohm**

$Z_B = Z_o(N-1)$

$\therefore N = \frac{Z_B}{Z_o} + 1$

$= \frac{200}{600} + 1$

= 1,333

dB = 20 log N

= 20 log 1,333

= 2,5 (2)

Vir 400 ohm

$Z_B = Z_o(N-1)$

$\therefore N = \frac{Z_B}{Z_o} + 1$

$= \frac{400}{600} + 1$

= 1,667

dB = 20 log N

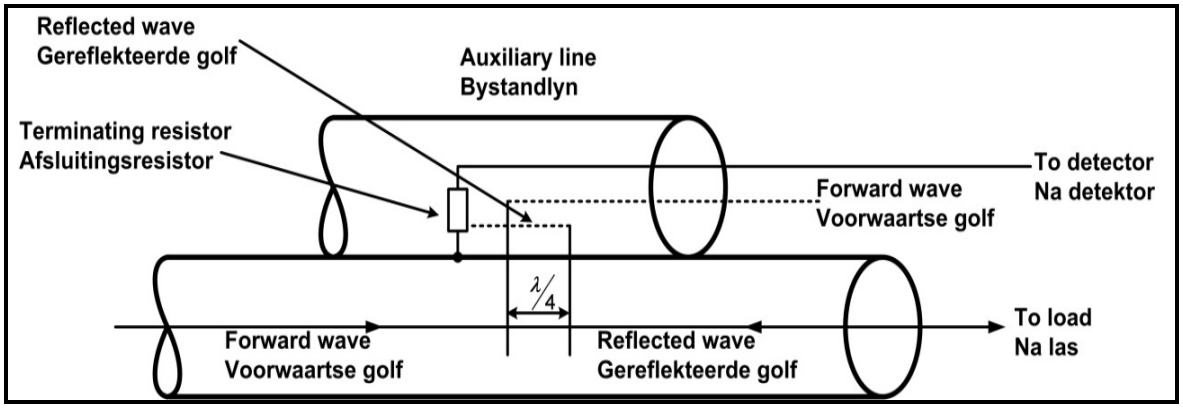
= 20 log 1,667

= 4,44 (2)

[18]

VRAAG 3

3.1



(8)

3.2 3.2.1 Dit stem reaktiewe komponente uit.

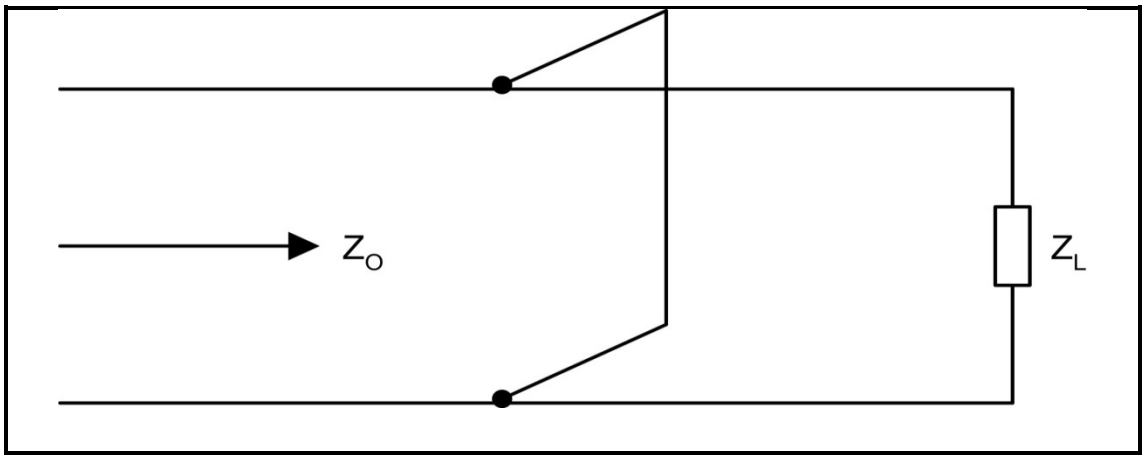
3.2.2 Dit meet 'n transmissielyn se krag.

3.2.3 Dit pas ongebalanseerde en gebalanseerde toestelle bymekaar.

3.2.4 Dit bepaal die posisie en grootte van die 'n las se eerste maksimum spanning.

(4 × 1) (4)

3.3



Die stompie is 'n kort stukkie draad wat oor die transmissielyn gekortsluit word. (4)

3.4 3.4.1 $$\text{SWR/SVG} = \frac{Z_L}{Z_o}$$

$$= \frac{750}{600}$$

$$= \mathbf{1,25}$$

3.4.2 $$\text{SWR/SVG} = \frac{Z_L}{Z_o}$$

$$= \frac{900}{600}$$

$$= \mathbf{1,5}$$

(2 × 1) (2)
[18]

VRAAG 4

4.1 4.1.1 $dB = 10 \log S/N$

$\therefore S/N = \text{antilog}\frac{dB}{10}$

$= \text{antilog}\frac{15}{10}$

$= \mathbf{31,623}$

$\therefore C = \Delta f.\log_2[1 + S/N]$

$= 10 \times 10^3 \log_2[1 + 31,623]$

$= 10 \times 10^3 \log_2[32,623]$

$= 10 \times 10^3 \left[\frac{\log 32,623}{\log 2}\right]$

$= \mathbf{50\ 278,18\ bit/sek}$

4.1.2 $dB = 10 \log S/N$

$\therefore S/N = \text{antilog}\frac{dB}{10}$

$= \text{antilog}\frac{7,5}{10}$

$= \mathbf{5,623}$

$\therefore C = \Delta f.\log_2[1 + S/N]$

$= 20 \times 10^3 \log_2[1 + 5,623]$

$= 20 \times 10^3 \log_2[6,623]$

$= 20 \times 10^3 \left[\frac{\log 6,623}{\log 2}\right]$

$= \mathbf{54\ 549,7\ bit/sek}$

(2 × 2) (4)

4.2 $En = \sqrt{4.K.T.\Delta F.R}$

$$\therefore R = \frac{En^2}{4.K.T.\Delta F}$$

$$= \frac{\left(18 \times 10^{-6}\right)^2}{4 \times 1{,}38 \times 10^{-23} \times 298 \times 30 \times 10^3}$$

= 656,551 kΩ (3)

4.3 4.3.1
- Weerlig
- Statiese elektrisiteit (Enige 1 × 1) (1)

4.3.2
- Ontstekingstelsels
- Elektriese motors (Enige 1 × 1) (1)

4.3.3
- Fluoresseerligte
- Die willekeurige beweging van atome en molekules in alle soorte materiaal (2)

4.4 4.4.1 **dB** = 10 log F

$$\therefore \mathbf{F} = \text{antilog } \frac{dB}{10}$$

$$= \text{antilog } \frac{2{,}755}{10}$$

$$= \mathbf{1{,}886}$$

$$\mathbf{F} = 1 + \frac{R'_{eq}}{R_a}$$

$$\therefore R'_{eq} = R_a(F - 1)$$

$$= 85(1{,}886 - 1)$$

$$= \mathbf{75\ ohm}$$ (4)

4.4.2 $\mathbf{T_{eq}} = T_O(F - 1)$

$$= 297(1{,}886 - 1)$$

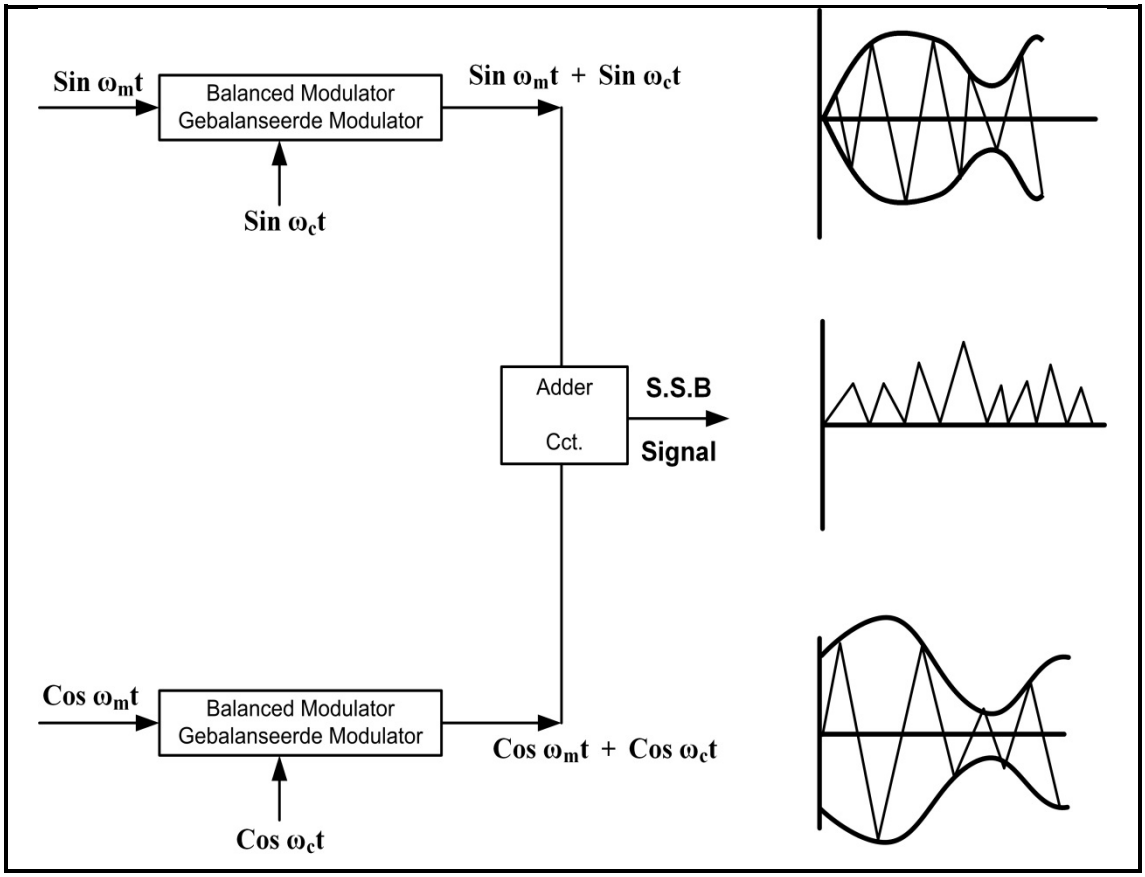
$$= \mathbf{263\ K}$$

$$\therefore \mathbf{t} = \mathbf{-10\ ^0C}$$ (1)

[16]

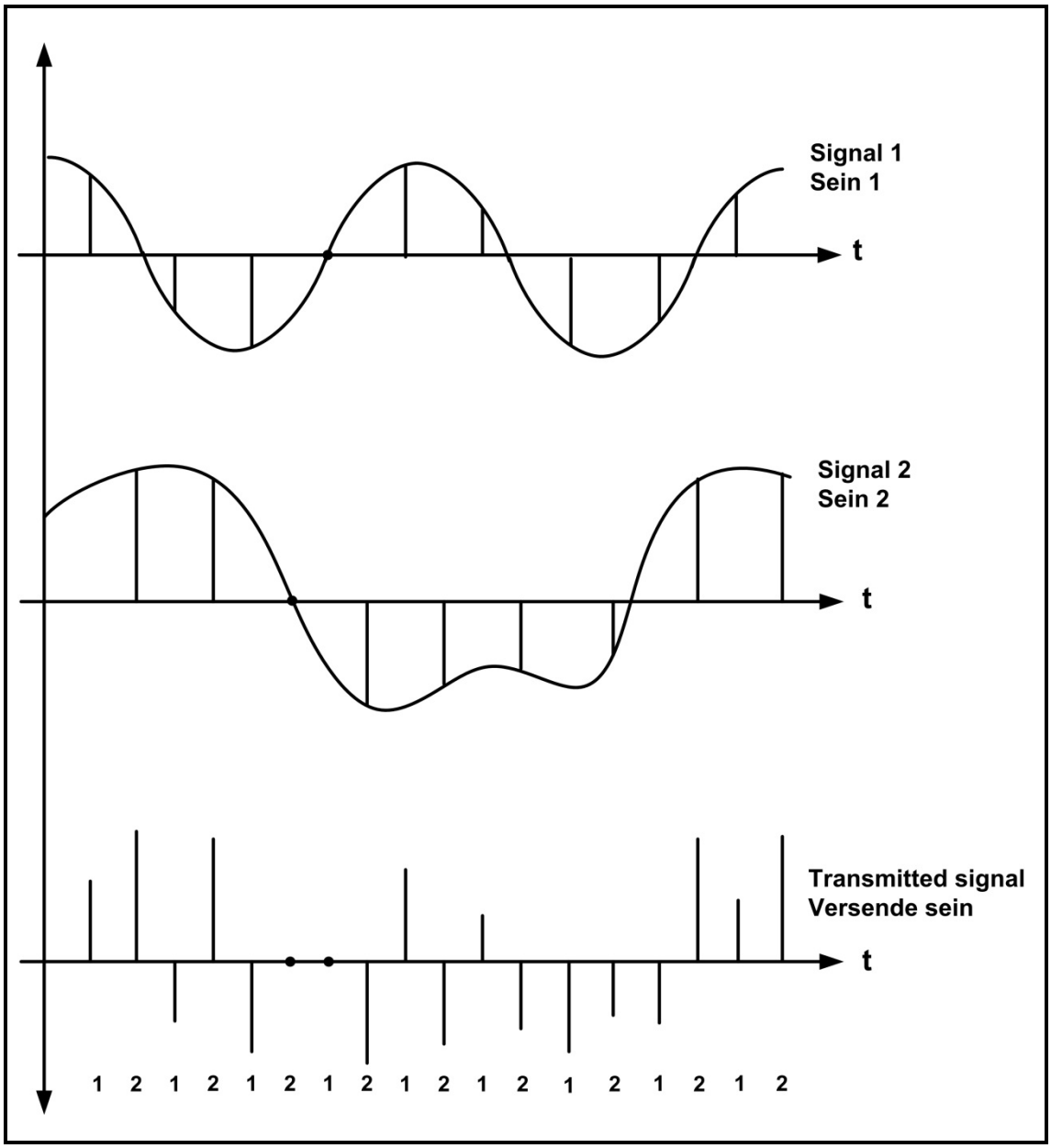
VRAAG 5

5.1


Sin ωmt
Balanced Modulator
Gebalanseerde Modulator
Sin ωct
Sin ωmt + Sin ωct
Adder
Cct.
S.S.B
Signal
Cos ωmt
Balanced Modulator
Gebalanseerde Modulator
Cos ωct
Cos ωmt + Cos ωct

(12)

5.2 Steekproefneming is 'n proses waardeur dele van 'n sein teen 'n tempo van T = ½ sekonde geneem en oorgedra word.



(6)
[18]

VRAAG 6

6.1 6.1.1 P_R = Pd.A

$= 1,2\times10^{-12}\times12$

$= 14,4\times10^{-12}$ watt (1)

6.1.2 $A = \frac{G.\lambda^2}{4.\pi}$

$\lambda = \frac{c}{f}$

$\frac{A.4.\pi}{\lambda^2}\lambda = \frac{3\times10^8}{120\times10^6}$

$= \frac{12\times4\times3,142}{2,5^2}$

= 2,5 m

= **24,131** (3)

$\therefore$ dB = 10 log G

= 10 log 24,131

= 13,826 dB (1)

6.2 6.2.1 'n Ontvangantenne is 'n toestel wat 'n hoeveelheid elektromagnetisme omskakel in ooreenstemmende elektriese stroom.

6.2.2 'n Uitsaai-antenne is 'n toestel wat elektriese stroom omskakel in 'n ooreenstemmende hoeveelheid elektromagnetisme.

6.2.3 'n Rigversterkfaktor is die drywingsdigtheid wat in 'n spesifieke rigting uitgestraal word in verhouding tot die drywingsdigtheid van 'n bolantenne.

(3 × 2) (6)

6.3 Hoekmodulasie word gedefinieer as die modulasie waardeur die oombliklike hoeksnelheid van die draergolf varieer, en dit lei tot twee soorte modulasie, te wete frekwensiemodulasie en fasemodulasie. (2)

[13]

TOTAAL: 100

Kopiereg voorbehou