higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

KOMMUNIKASIE-ELEKTRONIKA N5

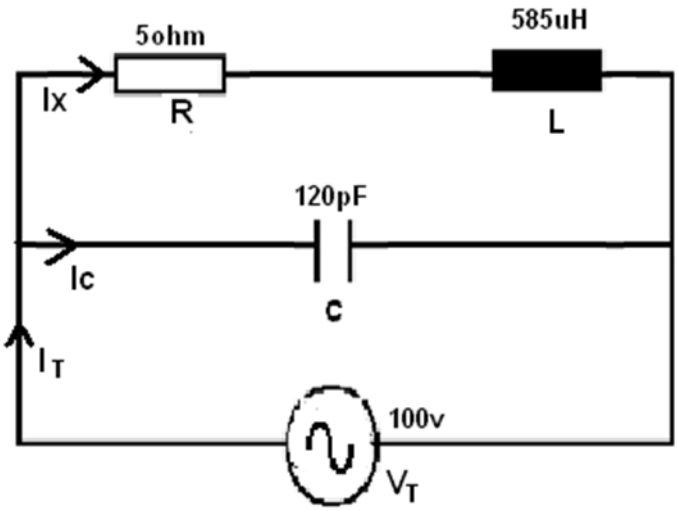
27 MAART 2018

Hierdie nasienriglyn bestaan uit 10 bladsye.

Kopiereg voorbehou

VRAAG 1: WISSELSTROOMNETWERKE

1.1 1.1.1



(2)

1.1.2 Zd = $\frac{L}{CR}$

= $\frac{585 \text{ x } 10^{-6}}{120 \text{ x}10^{-12}\text{x } 5}$

= 975 KΩ (2)

1.1.3 Q = $\frac{1}{R}\sqrt{\frac{L}{C}}$

= $\frac{1}{5}\sqrt{\frac{585 \text{ x } 10^{-6}}{120 \text{ x}10^{-12}}}$

= 442 (2)

1.1.4 Ic = IQ

But i = $\frac{V}{\text{Zd}}$

i.e = $\frac{100}{975}$

= 102,56 µA

Ic = $102{,}56 \text{ x } 10^{-6}$ x 442

= 45 mA

(5)

1.1.5 Fr = $\frac{1}{2\pi\sqrt{LC}}$

= $\frac{1}{2\pi\sqrt{585\ x10^{-6}x\ 120x10^{-12}}}$

= <u>601 KHz</u> (2)

1.2 Q = $\frac{XL}{R}$

En XL = 2πfL

= 2π x $601\ x10^{3}$x $585\ x\ 10^{-6}$

= 2209, 36 Ω

Q = $\frac{XL}{R}$

= $\frac{2209,36}{5}$

= 441, 81 = 442 (4)

1.3 Die koppelkoëffisiënt druk die mate van koppeling tussen die primêre en die sekondêre uit en is die verhouding van wedersydse induktansie tot maksimum induktansie. (3)

1.4 1.4.1 (a) primêre (b) impedansie (c) gekoppelde (d) gereflekteerde (4)

1.4.2 (e) spanning (f) stroom (g) naloop (3)

1.4.3 (h) sekondêre (i) geïnduseerde (j) wikkeling (3)
[30]

VRAAG 2: VIER-AANSLUITERNETWERKE

Kyk in vanaf R1

$$R1 = RA + \frac{RB \times R2}{RB + R2} \quad (1)$$

Vermenigvuldig met die gemeenskaplike noemer RB + R2

$$R1 (RB + R2) = RA (RB + R2) + RB. R2$$

$$R1RB + R1R2 = RARB + RAR2 + RB. R2 \ldots\ldots\ldots\ldots Eq.\ 1 \quad (2)$$

Kyk in vanaf R2

$$R2 = \frac{RB(R1 + RA)}{RB + (R1 + RA)}$$

$$R2 = \frac{RBR1 + RARB}{RB + R1 + RA} \quad (2)$$

Vermenigvuldig met die gemeenskaplike noemer RB + R1 + RA

$$R2 (RB + R1 + RA) = R1RB + RARB$$

$$R2\,RB + R1\,R2 + R2RA = R1RB + RARB \ldots\ldots\ldots\ldots\ldots\ldots Eq.\ 2 \quad (2)$$

Tel Eq.1 en Eq.2 bymekaar

$$R1RB + R1R2 = RARB + RAR2 + RB. R2$$

$$R2\,RB + R1\,R2 + R2RA = R1RB + RARB$$

$$2\,R1\,R2 + R1RB + R2\,RB + R2RA = 2\,RARB + RAR2 + R1RB + RB. R2$$

$$\therefore 2\,R1\,R2 = 2\,RARB$$

$$R1\,R2 = \frac{2RARB}{2}$$

$$R1\,R2 = RARB$$

$$\text{Dus } RA = \frac{R1R2}{RB} \quad (5)$$

Vervang vir RA in Eq.1 $\frac{R_1R_2}{R_B}$

$$R_1R_B + R_1R_2 = R_AR_B + R_AR_2 + R_B.R_2 \ldots.Eq.1.$$

$$\therefore R_1R_2 + R_1R_B = \left(\frac{R_1R_2}{R_B}\right)\cancel{R_B} + \left(\frac{R_1R_2}{R_B}\right)R_2 + R_B.R_2$$

$$R_1R_2 + R_1R_B = R_1R_2 + \frac{R_1R_2^2}{R_B} + R_B.R_2 \quad (4)$$

<u>Vermenigvuldig met noemer RB</u>

$$R_B(R_1R_2 + R_1R_B) = R_B(R_1R_2) + \frac{R_B}{1}\left(\frac{R_1R_2^2}{R_B}\right) + (R_B.R_2)R_B$$

$$\cancel{R_BR_1R_2} + R_1R_B^2 = \cancel{R_BR_1R_2} + R_1R_2^2 + R_2R_B^2$$

$$R_1R_B^2 = R_1R_2^2 + R_2R_B^2$$

$$R_1R_B^2 - R_2R_B^2 = R_1R_2^2 \quad (3)$$

<u>Neem die gemeenskalike faktor RB ²</u>

$$R_B^2(R_1 - R_2) = R_1R_2^2$$

$$\therefore R_B^2 = \frac{R_1R_2^2}{R_1 - R_2}$$

$$\text{Dan RB} = \sqrt{\frac{R_1R_2^2}{R_1 - R_2}} \quad (2)$$

Om RA te bepaal, verdeel: $RA = \frac{R1R2}{RB}$

$$\therefore RA = \frac{R1 - R2}{\sqrt{\frac{R1R2^2}{R1-R2}}}$$

$$= \frac{R1\ R2}{\sqrt{R1R2^2}} \div \frac{1}{\sqrt{R1-R2}}$$

$$= \frac{R1\ R2}{\sqrt{R1R2^2}} \times \frac{\sqrt{R1-R2}}{1}$$

$$= \frac{R1\ \cancel{R2}}{\cancel{R2}\sqrt{R1}} \times \frac{\sqrt{R1-R2}}{1}$$

$$= \frac{R1}{\sqrt{R1}} \times \frac{\sqrt{R1-R2}}{1}$$

$$= \frac{\sqrt{R1}\ .\sqrt{R1}}{\sqrt{R1}} \times \frac{\sqrt{R1-R2}}{1}$$

$$= \frac{(\sqrt{R1}\ .\cancel{\sqrt{R1}})}{\cancel{\sqrt{R1}}} \times \frac{\sqrt{R1-R2}}{1}$$

$$= \sqrt{R1} \times \sqrt{R1-R2}$$

$$RA = \sqrt{R1(R1-R2)}$$

(9)
[30]

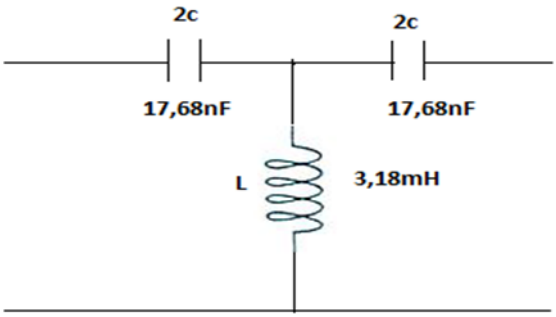
VRAAG 3: FILTERS

3.1

$$L = \frac{Ro}{4\pi Fc}$$

$$= \frac{600}{4\pi \text{ x } 15000}$$

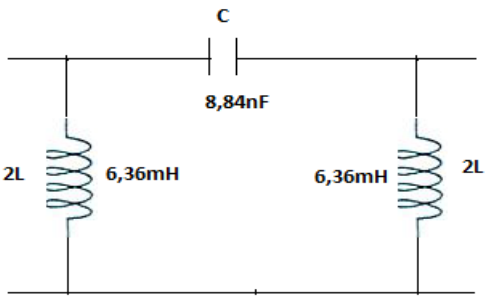
$$= 3{,}18 \text{ mH}$$



$$C = \frac{1}{4\pi RoFc}$$

$$= \frac{1}{4\pi \text{ x } 600 \text{ x } 15000}$$

$$= 8{,}84\text{nF}$$



(8)

3.2

$$\frac{c}{2} = 20\,\mu F$$

$$\therefore C_T = 40\,\mu F$$

$$f_c = \frac{1}{\pi\sqrt{LC}}$$

$$= \frac{1}{\pi\sqrt{0,1x0,00004}}$$

$$= 159,15\ Hz \quad (2)$$

[10]

VRAAG 4: ONTVANGERS EN SENDERS

4.1 4.1.1 Draerrotasie (1)

4.1.2 Stilstaande draer (1)

4.2
A Vc
B USF
C LSF
D Wc + Wm
E Wc – Wm
F Wm
G Wm
H Vc (8)

4.3 4.3.1
- Vereenvoudig die toerusting van sender en ontvanger
- Verminder die koste van die ontvanger
- Gebruik 'n eenvoudige omhulde opspoorder in die ontvanger

4.3.2
- Duur en gesofistikeerde toerusting
- Minder senderkrag
- Smal bandwydte

(2 × 3) (6)

4.4 mf = Maksimum afwyking (∆)Modulasiefrekwensie (Fm) Maksimum afwyking (∆)Modulasiefrekwensie (Fm)─

$$= \frac{15}{5}$$

$$= 3$$

$$\therefore \text{ Bandwydte } = \text{modulasiefrekwensie} \times \text{aantal sybande} \times 2$$

$$= 5 \times 6 \times 2$$

$$= \underline{60 \text{ KHz}}$$ (4)

[20]

VRAAG 5: ANTENNES

5.1
- Die halfgolfdipool is baie onstabiel vir HF, BHF and UHF.
- Teen laer frekwensies is die fisiese afmetings van die halfgolfdipoolantenne te groot. (2)

5.2 Effektiewe irisopening is die fisiese afmetings van die antenne wat bepaal hoeveel krag deur 'n antenne ontvang kan word en is direk eweredig aan die opvangsoppervlak van die antenne. (3)

[5]

VRAAG 6: BODE-STIPPINGS

6.1
- Integreerder
- Differensieerder (2)

6.2 Albei kringe word gebruik om 'n benadering van die frekwensie en faserespons van RK-kringe te bepaal. (3)

[5]

TOTAAL: 100

Kopiereg voorbehou