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FEE Assignment -4

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So

(P-1)

(Q1.) $X = 19$

$Y = 10$

$\therefore i(\theta) = X + Y \sin\theta$

~~for~~ the average value is area under the curve but the $Y \sin\theta$ function over $2\pi \to 0$

So only 'X' remains whose value is

$= 19.00$

(Q2.) $i(\theta) = X + Y \sin\theta \quad X = 1.5 \quad Y = 19$

$$I_{rms} = \sqrt{\frac{1}{2\pi}\int_0^{2\pi} (1.5 + 19\sin\theta)^2 \cdot d\theta}$$

$I_{rms} = 13.519$

(Q3) $I_{rms} = \sqrt{\frac{1}{2\pi}\int_0^{2\pi} (12 + 7.50\sin\theta)}$ $X = 12 \quad Y = 7.50$

$R = 31$

$= \sqrt{\frac{X^2 + Y^2}{2}}$

$= 13.11$

$= P = I_{rms}^2 \times R$

$= 2210.875$

(P-2)

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(Q4) $V_s^2 = V_R^2 + V_L^2 + 2VV_L \cos\phi$

(OR)

$230^2 = 75^2 + (192)^2 + 2(75)(187)\cos\phi$

$0.573 = \cos\phi$

(Q5) $X = 168$

$R_{load} = 79\Omega$

$\cos\phi = 0.756$

$0.756 = \frac{168}{Z} = 222.222$

$Z =$

$I = \frac{168}{222.22} = 0.756$

$= I^2 \cdot R_{load}$

$= 0.756 * 79 =$ 204.186

FEE Assignment 4

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Problem - 3

(Q6)

$X = 5$

$Z = 25$

$$I_{rms} = \sqrt{\frac{\int I^2 \cdot dt}{\int dt}}$$

At 40Hz; $Z_{40} = \frac{V}{I} = \frac{150}{5} = 30$

At 50Hz; $Z_{50} = \frac{V}{I} = \frac{150}{25} = 6$

Eqns:-

$30^2 = R^2 + X_{C_1}^2$

$6^2 = R^2 + (X_{C_2})^2 \Rightarrow 6^2 = R^2 + (0.8 X_{C_1})$

$-X_{C_1} = 0.8 X_{C_2} \rightarrow (2)$

On solving,

we get

$X_{C_1} \simeq 48.99\ \Omega$

$X_{C_2} \simeq 39.192$

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(Q7) ~~X~~ Y = 14A
~~Z~~ Z = 26A

$Z_{40} = V/I = 150/14 = 10.714$
$Z_{50} = V/I = 150/26 = 5.769$

(Eqns)

$(10.714)^2 = R^2 + X_{C1}^2$
$(5.769)^2 = R^2 + X_{C2}^2 = R^2 + (0.8 X_{C1})^2$

$\therefore X_{C1} = 15.047\Omega$
$X_{C2} = 12.038$

(Q8) $Q = VI \sin\phi$

V = 150 Y = 7A H_2
$I = \frac{V}{Z}$ Z = 27A

$Z_{50} = \frac{V}{Z} = \frac{150}{27} = 5.556$ $Z_{40} = 21.429$

X_C at 50 H_2 :

$(21.429)^2 = R^2 + (X_{C1})^2$
$(5.556)^2 = R^2 + (X_{C2})^2$
$(5.556)^2 = R^2 + (0.8 X_{C1})^2$

X_{C1} (40Hz) : 34.493
X_{C2} (50Hz) : 27.595

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$Q = |I|^2 X_C$

$= (27)^2 \cdot (27.595)$

$= 20116.396$

Problem 4:

(a) $X = 3.50$

$Y = 7.50$

$P_t = V_t I_t = X^2 + XY \sin(\omega t + 90) + 10X(\sin(\omega t - 30))$

$+ 10Y(\sin(\omega t + 90) \sin(\omega t - 30))$

$P_{avg} = x^2 + xy\cos(\omega t) + 10(xy)$

$P_{AC} = -10\cos(\omega t + 60)$

$P_{DC} = V_{DC} = 7.5\cos\omega t$

7.5

$\frac{10 \times 3}{2} \cos 240$

$= -18.75$

$V_{DC} \times I_D = 3.50 \cdot 3.50 = 12.25$

$12.25 - 18.75$

$= -6.5$

(Q10:)

$P_{DC} =$

$15.50 \cdot 15.50 = 240.25$

$= \frac{10}{2} \times Y \times (-1/2)$

$= -2.5y$

$P_{DC} + P_{AC} = 0$

$240.25 - 2.5y = 0$

$y = 96.1$