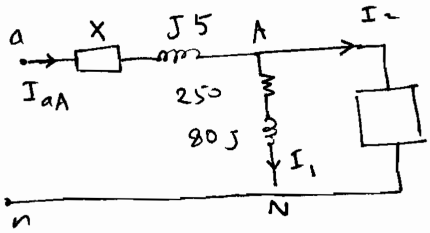
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE205: Electric Circuit II (082)
Quiz 2 (Take Home): Balanced 3 Phase Systems 11.4-11.6

Serial #
6
- 1 points for not writing your serial number

Name: KEY "Corrected" Sec.

Two balanced three-phase Δ-connected loads are connected in parallel. Load 1 has an impedance per phase of 750+*j* 240 Ω/Ø; and load 2 is 112.32+ *j* 95.04 kVA (*hint: load 2 is represented by its **3-phase** complex power*) . The loads are fed from a distribution line with an impedance of X+ *j* 5 Ω/Ø. The magnitude of the phase voltage at the load end of the line is 7.2kV. The a-phase voltage at the load is specified as the reference phasor. Assume positive sequence. The <u>total</u> complex power at the sending end of the line is 683419+*j* 292716 VA
Find the value of X ?

Single Phase Equivalent Circuit



To convert load 1 Δ→Y

$Z_Y = \frac{Z_\Delta}{3} = \frac{750 + j240}{3} = 250 + j80$

load 2 . The perphase S_ϕ

$S_{2\phi} = \frac{S_{T_2}}{3} = \frac{112.32 + j95.04\,k}{3}$

$= 37440 + 31680 J$

We need I_1 & I_2

$I_1 = \frac{(7200/\sqrt{3}) \angle -30^\circ}{250 + j80}$

$= 15.83 \angle -47.75^\circ$

for I_2 (in the Equivalent Y)

$S_\phi = V I_2^* \Rightarrow I_2^*$

$\frac{37440 + j31680}{7200/\sqrt{3} \angle -30^\circ} = I_2^*$

$I_2 = 11.798 \angle -70.24^\circ$

$I_{aA} = I_1 + I_2 = 27.11 \angle -57.32^\circ$

Total sent power per phase

$S_{\phi\,send} = \frac{S_{Tsend}}{3}$

$= 227806.33 + j\,97572$

$S = V_{an} I_{aA}^*$

$V_{an} = 9139.68 \angle -34.13^\circ$

V_{aA} (voltage drop across the line)

$= V_{an} - V_{AN}$

$= 9139.68 \angle -34.13^\circ - \frac{7200}{\sqrt{3}} \angle -30^\circ$

$= 5002.56 \angle -37.56$

$Z_L = \frac{V_{aA}}{I_{aA}} = 173.64 + j62.3$

$Z_L = X + j5 = 173.64 + j62.3$

$\Rightarrow X = 173.64 + j\,57.3$

X is not pure resistive

The use of R was confusing.

$R + j5 = X + j5$

I have not given nor received any help in solving this quiz Sign

Let us learn from our mistakes Good Luck, **Dr. Ali Muqaibel**