Sultan Qaboos University
College of Engineering
Electrical and Electronics Engineering Department

Quiz #1 With Typical Answers

Course Code	: Electric Circuits II	**Instructor**	: Dr. Adel Gastli
Course Code	: ELEC3122	**Date**	: Tue. 27-06-2000
Semester	: Summer 2000	**Time**	: 20 min

Student name: *Marks*

Student ID No.:

100

Questions

For the circuit in Fig. 1:

1. Find the total admittance $\overline{Y}_T$ in polar form.
2. Sketch the admittance diagram.
3. Find the value of C in microfarads and L in henries.
4. Find the current i_T and current i_R, i_L, and i_C in Phasor form.
5. Sketch the Phasor diagram of the currents $\overline{I}_T, \overline{I}_R, \overline{I}_L$, and $\overline{I}_C$ and the voltage $\overline{E}$.

$$e = 35.4\sin(314t + 60^o)$$

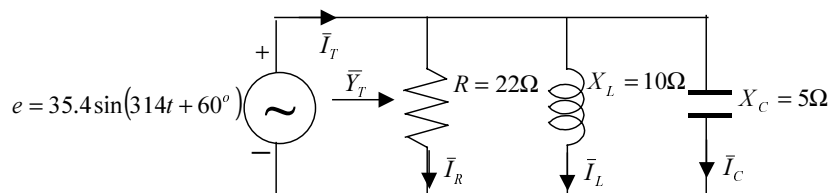$R = 22\Omega$ $X_L = 10\Omega$ $X_C = 5\Omega$

Fig. 1

Answers

1. The equivalent total admittance is calculated as follows:

$$\overline{Y}_1 = \frac{1}{R} = \frac{1}{22} = 0.04545\lfloor 0^o = 0.0454 + j0$$

$$\overline{Y}_2 = \frac{1}{jX_L} = \frac{1}{10\lfloor 90^o} = 0.1\lfloor -90^o = 0 - j0.1$$

$$\overline{Y}_3 = \frac{1}{-jX_c} = \frac{1}{5\lfloor -90^o} = 0.2\lfloor 90^o = 0 + j0.2$$

$$\overline{Y}_T = \overline{Y}_1 + \overline{Y}_2 + \overline{Y}_3 = 0.04545 + j0.1 = 0.11\lfloor 65.56^o$$

2. The admittance diagram is as follows:
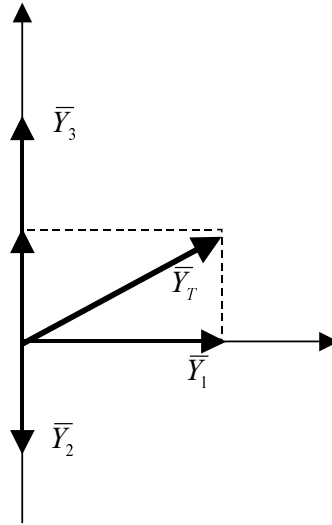
3. The capacitor and inductance values are determined as follows:

$$\omega = 314$$

$$X_L = \omega L = 10 \Rightarrow L = \frac{X_L}{\omega} = \frac{10}{314} = 0.032\text{H}$$

$$X_C = \frac{1}{\omega C} = 5 \Rightarrow C = \frac{1}{314 \times 5} = 0.637 \times 10^{-3}\,\text{F} = 637\mu\text{F}$$

4. The branches currents are calculated as follows:

$$\overline{E} = \frac{35.4}{\sqrt{2}}\lfloor 60^o = 25\lfloor 60^o$$

$$\overline{I}_T = \overline{E} \times \overline{Y}_T = 25\lfloor 60^o \times 0.11\lfloor 65.56^o = 2.75\lfloor 125.56^o$$

$$\overline{I}_R = \overline{E} \times \overline{Y}_R = 25\lfloor 60^o \times 0.04545\lfloor 0^o = 1.14\lfloor 60^o$$

$$\overline{I}_L = \overline{E} \times \overline{Y}_L = 25\lfloor 60^o \times 0.1\lfloor -90^o = 2.5\lfloor -30^o$$

$$\overline{I}_C = \overline{E} \times \overline{Y}_C = 25\lfloor 60^o \times 0.2\lfloor 90^o = 5\lfloor 150^o$$

5. The phasor diagram is sketched as follows: