National University of Singapore

Department of Electrical & Computer Engineering

EE-1102:Introduction to Circuits and Systems

Tutorial - 6 (Power for AC Circuits)

Year 2013-14

Q.1 Consider the circuit as shown in Fig. 1. Find the phasor current, **I**. Find the corresponding active power, reactive power, apparent power delivered by the source. Find the power factor and indicate whether it is lagging or leading.

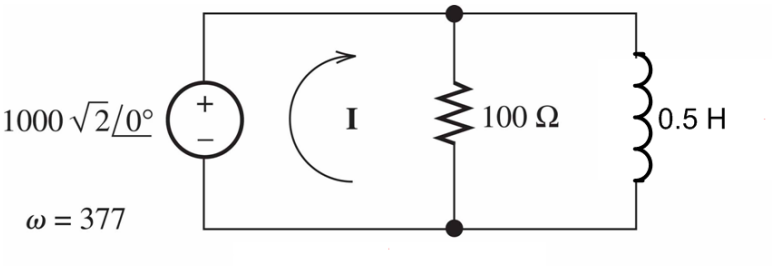

Figure 1: Q.1

(Ans. $11.3\sqrt{2}\angle -27.92$, 10 kW, 5.3 kVAR, 11.3 kVA, and 0.88 lag.)

Q.2 Determine the power for each element, including the sources as shown in Fig. 2. Also indicate whether each element is delivering or absorbing average power.

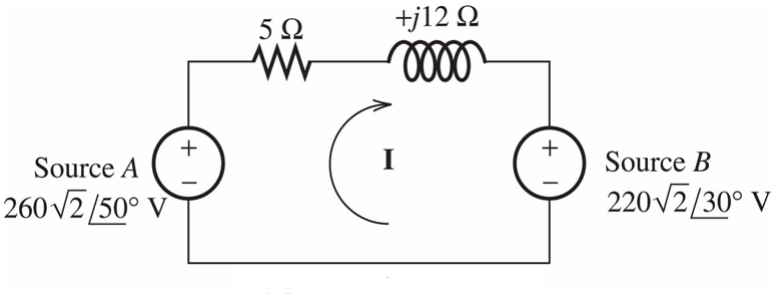

Figure 2: Q.2

(Ans. $7.1\sqrt{2}\angle 37.3, P_A = 1.798kW, Q_A = 0.4053kVAR, P_B = 1.547kW, Q_B = -0.198kVAR, P_R = 0.251kW, and Q_L = 0.601kVAR$)

Q.3 Two loads, A and B, are connected in parallel across a 1-kV, rms 60 Hz line as shown in the Fig. 3. Load A consumes 10 kW with a 90% lagging power factor. Load B has an apparent power of 15 kVA with a 80% lagging power factor. Find the active power, reactive power, and apparent power delivered by the source. Also determine the power factor see by the source.

Q.4 A 1000 V rms source delivers power to the load as shown in Fig. 4. The load consumes 100 kW with a power factor 25% lagging.

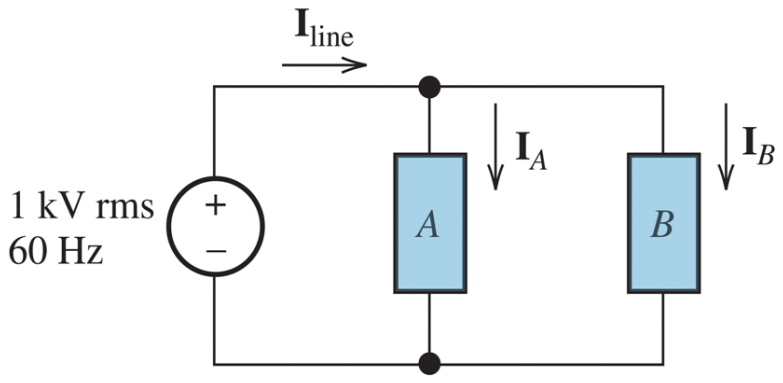

Figure 3: Q.3

1. Find the phasor **I** assuming that no capacitor is connected to the circuit.
2. Find the value of the capacitance that must be connected in parallel with the load as shown in the Fig. 4 to achieve a power factor of 100%.
3. Find the new value of the phasor **I** assuming that the capacitor is connected to the circuit.
4. Suppose that the source is connected to the load over long distance transmission lines, what are the potential advantages and disadvantages of connecting the capacitor across the load?

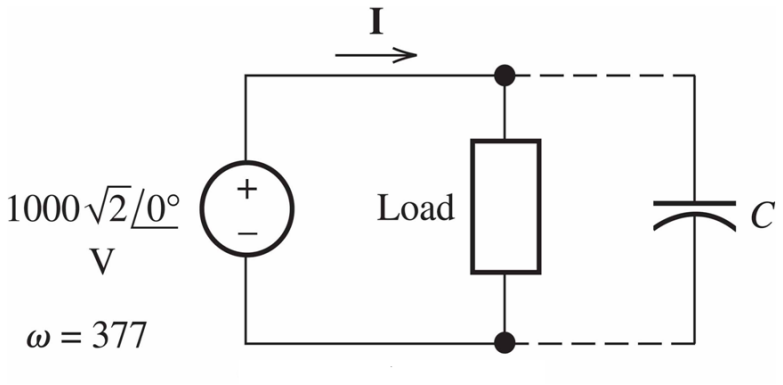

Figure 4: Q.4

(Ans. $400\sqrt{2}\angle -75.5, Q_C = -387.3kVAR, C = 1.02mF, and 100\angle 0,$)

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