ECE 3364, Dr. Hebert, Fall 2016 HW 1 Due 9/01

Problem 1.   (A) A voltage source operates at 220 V rms. Its load absorbs an average power of 10 kW at a lagging power factor of 0.75. Compute the complex power absorbed by the load and compute the impedance of the load.

(B) An electrical load operates at 120 V rms. The apparent power absorbed by the load is 4,500 VA at a leading power factor of 0.85. Compute the impedance of the load.

Problem 2.
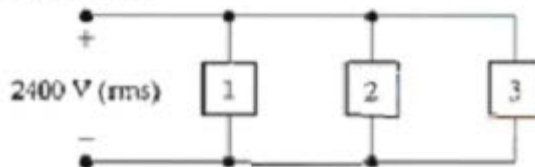Nilsson, eighth edition
Problem 10.20

10.20 Two 660 V (rms) loads are connected in parallel. The two loads draw a total average power of 52,800 W at a power factor of 0.8 leading. One of the loads draws 40 kVA at a power factor of 0.96 lagging. What is the power factor of the other load?

Problem 3.
Nilsson, eighth edition
Problem 10.22

10.22 Three loads are connected in parallel across a 2400 V (rms) line, as shown in Fig. P10.22. Load 1 absorbs 18 kW and 24 kVAR. Load 2 absorbs 60 kVA at 0.6 pf lead. Load 3 absorbs 18 kW at unity power factor.

a) Find the impedance that is equivalent to the three parallel loads.

b) Find the power factor of the equivalent load as seen from the line's input terminals.

Figure P10.22

Problem 4.
Nilsson, eighth edition
Problem 10.32

10.32 A factory has an electrical load of 1800 kW at a lagging power factor of 0.6. An additional variable power factor load is to be added to the factory. The new load will add 600 kW to the real power load of the factory. The power factor of the added load is to be adjusted so that the overall power factor of the factory is 0.96 lagging.

a) Specify the reactive power associated with the added load.

b) Does the added load absorb or deliver magnetizing vars?

c) What is the power factor of the additional load?

d) Assume that the voltage at the input to the factory is 4800 V (rms). What is the rms magnitude of the current into the factory before the variable power factor load is added?

e) What is the rms magnitude of the current into the factory after the variable power factor load has been added?

Problem 5.
Nilsson, eighth edition
Problem 10.33

10.33 Assume the factory described in Problem 10.32 is fed from a line having an impedance of $0.02 + j0.16\ \Omega$. The voltage at the factory is maintained at 4800 V (rms).

a) Find the average power loss in the line before and after the load is added.

b) Find the magnitude of the voltage at the sending end of the line before and after the load is added.