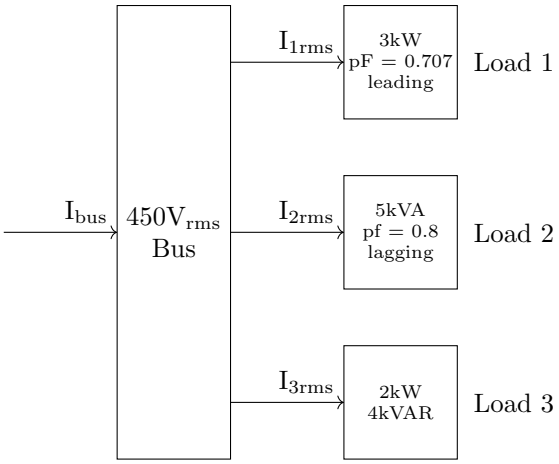
1. Analyze the following AC power system with three loads connected to a $450V_{rms}$ bus.



(a) Find the real and reactive powers for each of the 3 loads.

$P_1 =$ 3kW

$Q_1 =$ −3 kVAR

$S_1 =$ 4.24 kVA

$P_2 =$ 4 kW

$Q_2 =$ +3kVAR

$S_2 =$ 5kVA

$P_3 =$ 2kW

$Q_3 =$ 4kVAR

$S_3 =$ 4.47 kVA

(b) Find the total real and reactive powers supplied by the bus to the loads

$P_{\text{bus}} =$ 9kW

$Q_{\text{bus}} =$ 4kVAR

(c) Find the bus apparent power.

$S_{\text{bus}} =$ 9.85 kVA

(d) Find the RMS value of the bus current.

$I_{\text{bus}} =$ 21.9 Arms

2. A 3HP induction motor is powered from a $220V_{rms}$ bus. While delivering rated power, it operates at 80% efficiency and 0.85 power factor (lagging).

   (a) Find the real mechanical power out in Watts.

   $P_{mech} =$ 2.24 kW

   (b) Find the real electrical power into the motor.

   $P =$ 2.80 kW

   (c) Find the apparent power of the motor

   $S_{motor} =$ 3.29 kVA

   (d) Find the reactive power of the motor.

   $Q_{motor} =$ 1.73 kVAR

   (e) Find the current drawn by the motor from the $220V_{rms}$ bus

   $I_{motor} =$ 15.0 A rms

(f) We wish to reduce this current to 13A by attaching a second item to the 220V_{rms} bus that has only a negative reactive power. Determine the amount of that reactive power.

$Q_{\text{device}} =$ -1.14 kVAR