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## Question: Two impedances $Z_1 = 0.8 + j5.6 \text{ Ohm}$ and $Z_2 = 8 + j16 \text{ Ohm} \dots$

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Answer a&amp;b&amp;c

Two impedances  $Z_1 = 0.8 + j5.6 \text{ } \Omega$  and  $Z_2 = 8 + j16 \text{ } \Omega$ , and a single phase motor are connected in parallel across a 200V rms, 60Hz supply. The motor draws 5KVA at 0.8 power factor lagging.

- Find the complex powers  $S_1, S_2$  for the two impedances, and  $S_3$  for the motor.
- Determine the total power taken from the supply, the supply current, and the overall power factor.
- (bonus) A capacitor is connected in parallel with the loads. Find the kvar and the capacitance in  $\mu F$  to improve the overall power factor to unity. What is the new supply current?

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### Expert Answer



madhusudhan answered this  
476 answers

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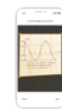
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① Total complex power

$$S_1 = \frac{|V|^2}{Z_1^*}$$

$$= \frac{(200)^2}{(0.8 - j5.6)}$$

$$= \frac{40000(0.8 + j5.6)}{(0.8)^2 + (5.6)^2}$$

$$= \frac{40000(0.8 + j5.6)}{32}$$

$$= 1000 + j7000 \text{ VA}$$

$$S_2 = \frac{|V|^2}{Z_2^*} = \frac{(200)^2}{8 - j16} = \frac{40000(8 + j16)}{(8^2 + (16)^2)}$$

$$= 1000 + j2000 \text{ VA}$$

$S_3 = 5000$  with power factor 0.8

$\cos \phi = 0.8 \Rightarrow \phi = 36.87^\circ$

$$S_3 = 5000 \angle 36.87^\circ = 4000 + j3000 \text{ VA}$$

Total complex power

$$S = 6000 + j12000$$

$$= 13416 \angle 63.43^\circ \text{ KVA}$$

b)  $S = VI \Rightarrow I = \frac{S}{V} = \frac{13416 \angle 63.43^\circ}{200 \angle 0^\circ}$

$$= 67.16 \angle 63.43^\circ$$

overall power factor

$$\cos(63.43^\circ) = 0.82638 = 0.447$$

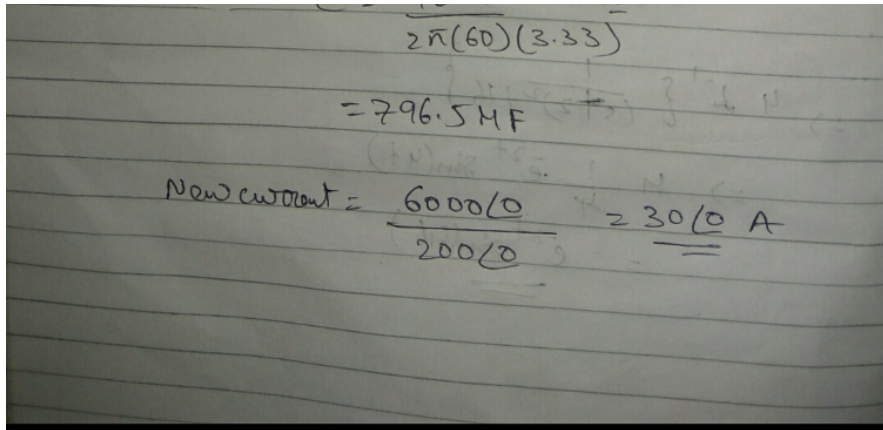
$$\cos(63.43^\circ) = 0.447$$

c)  $\neq$  overall unity power

$$Z_c = \frac{|V|^2}{S_c^*} = \frac{(200)^2}{j12000}$$

$$= \frac{40000}{j12000} = -3.33j$$





$$2\pi(60)(3.33) = 796.5 \text{ MF}$$

$$\text{New current} = \frac{6000}{200} = 30 \text{ A}$$

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Q: Two impedances,  $Z_1 = 0.8 + j5.6 \text{ } \Omega$  and  $Z_2 = 8 - j16 \text{ } \Omega$ , and a single-phase motor are connected in parallel across a 200-V rms, 60-Hz supply as shown in Figure 2.23. The motor draws...

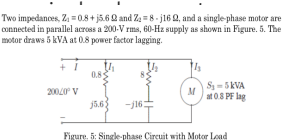
A: [See answer](#)

Q: Two impedances,  $Z_1 = 0.8 + j5.6 \text{ ohm}$  and  $Z_2 = 8 - j16 \text{ ohm}$ , and a single-phase motor are connected in parallel across a 200-V rms, 60-Hz supply as shown in figure 1. the motor draws 5 kVA at 0.8 power factor lagging. Find the complex powers  $S_1, S_2$  for the two impedances, and  $S_3$  for the motor. determine the total power taken from the supply, the supply current, and the overall...

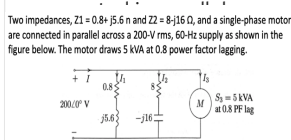
A: [See answer](#) 100% (3 ratings)[Show more](#) v

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Two impedances,  $Z_1 = 0.8 + j5.6 \text{ } \Omega$  and  $Z_2 = 8 - j16 \text{ } \Omega$ , and a single-phase motor are connected in parallel across a 200-V rms, 60-Hz supply as shown in Figure 5. The motor draws 5 kVA at 0.8 power factor lagging.

[See answer](#)

Two impedances,  $Z_1 = 0.8 + j5.6 \text{ } \Omega$  and  $Z_2 = 8 - j16 \text{ } \Omega$ , and a single-phase motor are connected in parallel across a 200-V rms, 60-Hz supply as shown in the figure below. The motor draws 5 kVA at 0.8 power factor lagging.

[See answer](#)

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Q: question 2.7

A: [See answer](#)

Q: Two impedances  $Z_1 = 0.8 + j5.6 \text{ ohm}$  and  $Z_2 = 8 - j16 \text{ ohm}$ , and a single-phase motor are connected in parallel across a 200-V rms, 60-Hz supply. The motor draws 5kVA at 0.8 power factor lagging. Find the complex powers  $S_1$  and  $S_2$  for the two impedances and  $S_3$  for the motor. Determine the total power taken from the supply, the supply current, and the overall power factor.

A: [See answer](#)[Show more](#) v

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