भारतीय प्रौद्योगिकी संस्थान तिरुपति
TIRUPATI

EE3003 Power Systems
Tutorial-2

1) A single-phase load is supplied with a sinusoidal voltage $v(t) = 200\cos(377\,t)$
The resulting instantaneous power is $p(t) = 800 + 1000\cos(754\,t - 36.87^\circ)$

a) Find the complex power supplied to the load.
b) Find the instantaneous current $i(t)$ and the rms value of the current supplied to the load
c) Find the load impedance

Solution:-
a) 800+j600 VA
b) i(t)=10cos(377t-36.87) A
c) Z_L=20<36.87 ohm

2) An inductive load consisting of R and X in series feeding from a 2400-V rms supply absorbs 288 kW at a lagging power factor of 0.8. Determine R and X.

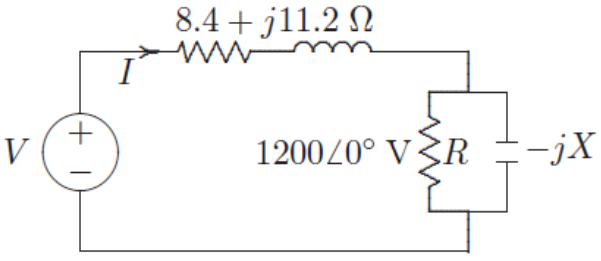
Solution:-
R= 12.8 ohm
X= 9.6 ohm

3) An inductive load consisting of R and X in parallel feeding from a 2400-Vrms supply absorbs 288 kW at a lagging power factor of 0.8. Determine R and X.

Solution:-
R= 20 ohm
X= 36.667 ohm

4) The load shown in Figure consists of a resistance R in parallel with a capacitor of reactance X. The load is fed from a single-phase supply through a line of impedance $8.4 + j11.2$ ohm. The rms voltage at the load terminal is 1200 V rms, and the load is taking 30 kVA at 0.8 power factor leading.

(a) Find the values of R and X.
(b) Determine the supply voltage V.



Solution:-
(a) R= 60 ohm
X= 80 ohm
(b) V= 1200+j350 V

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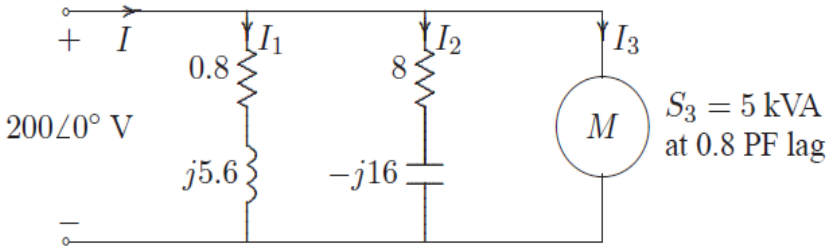
5) Two impedances, $Z_1 = 0.8 + j5.6\ \Omega$ and $Z_2 = 8 - j16\Omega$, and a single phase motor are connected in parallel across a 200-V rms, 60-Hz supply as shown in Fig. The motor draws 5 kVA at 0.8 power factor lagging.



(a) Find the complex powers S_1, S_2 for the two impedances, and S_3 for the motor.
(b) Determine the total power taken from the supply, the supply current, and the overall power factor.
(c) A capacitor is connected in parallel with the loads. Find the kvar and the capacitance in μF to improve the overall power factor to unity. What is the new line current?

Solution:-

a) S_1 = 1000+j7000 VA
   S_2 = 1000-j2000 VA
   S_3 = 4000 + j 3000 VA

b) S_{total} = 6+j8 KVA
   I=50<-53.13 A
   P.F = 0.6 lag

c) C= 530.5μF
   I=30 A