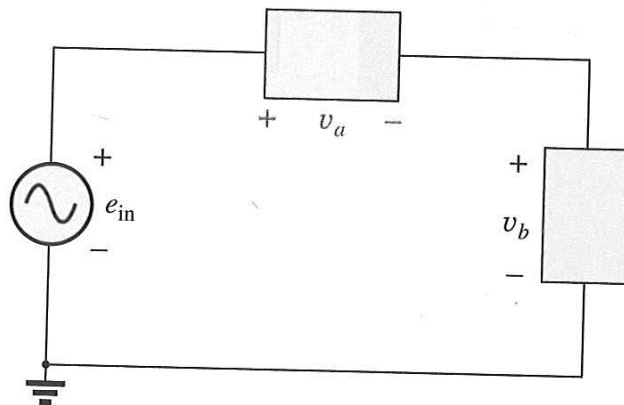


ENGG104 Tutorial 10 Class Questions

Team Name: _____

Question 1 - [past exam question]

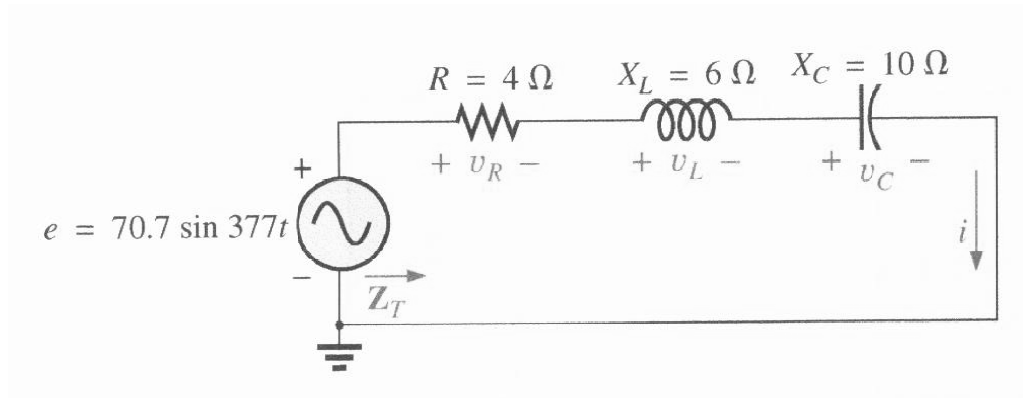


$$e_{in} = 60 \sin(377t + 45^\circ)$$

$$v_b = 20 \sin(377t - 45^\circ)$$

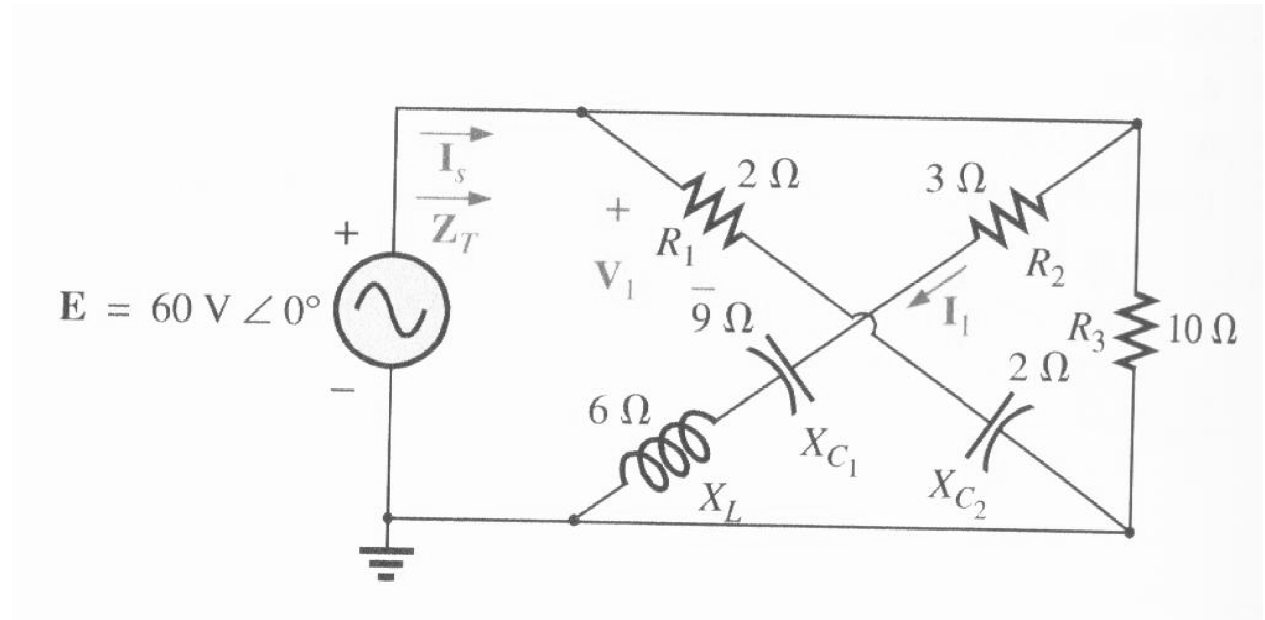
In the above circuit, e_{in} and v_b are given, determine the expression for v_a .

QUESTION 2 - [past exam question]



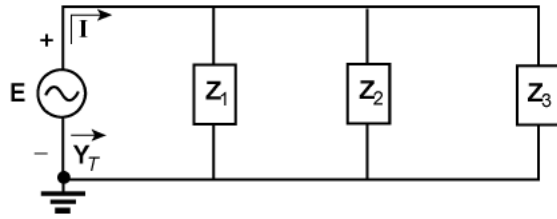
For the circuit above, find Z_T , X_L , X_C , I , V_R , V_L , V_C , Power delivered to the 4 Ohms resistor, and the power factor F_p

QUESTION 3 - [past exam question]



For the circuit above, find Z_T , V_1 , I_1 , and I_s

a.



$$Z_1 = 2 \, \Omega - j2 \, \Omega = 2.828 \, \Omega \angle -45^\circ$$

$$Z_2 = 3 \, \Omega - j9 \, \Omega + j6 \, \Omega$$

$$= 3 \, \Omega - j3 \, \Omega = 4.243 \, \Omega \angle -45^\circ$$

$$Z_3 = 10 \, \Omega \angle 0^\circ$$

$$Y_T = \frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3} = \frac{1}{2.828 \, \Omega \angle -45^\circ} + \frac{1}{4.243 \, \Omega \angle -45^\circ} + \frac{1}{10 \, \Omega \angle 0^\circ}$$

$$= 0.354 \, \text{S} \angle 45^\circ + 0.236 \, \text{S} \angle 45^\circ + 0.1 \, \text{S} \angle 0^\circ = 0.59 \, \text{S} \angle 45^\circ + 0.1 \, \text{S} \angle 0^\circ$$

$$= 0.417 \, \text{S} + j0.417 \, \text{S} + 0.1 \, \text{S}$$

$$Y_T = 0.517 \, \text{S} + j0.417 \, \text{S} = \mathbf{0.66 \, \text{S} \angle 38.89^\circ}$$

$$Z_T = \frac{1}{Y_T} = \frac{1}{0.66 \, \text{S} \angle 38.89^\circ} = \mathbf{1.52 \, \Omega \angle -38.89^\circ}$$

b. $V_1 = \frac{(2 \, \Omega \angle 0^\circ)(60 \, \text{V} \angle 0^\circ)}{2 \, \Omega - j2 \, \Omega} = \frac{120 \, \text{V} \angle 0^\circ}{2.828 \angle -45^\circ} = \mathbf{42.43 \, \text{V} \angle 45^\circ}$

c. $I_1 = \frac{E}{Z'} = \frac{60 \, \text{V} \angle 0^\circ}{3 \, \Omega - j9 \, \Omega + j6 \, \Omega} = \frac{60 \, \text{V} \angle 0^\circ}{3 \, \Omega - j3 \, \Omega} = \frac{60 \, \text{V} \angle 0^\circ}{4.243 \angle -45^\circ}$
 $= \mathbf{14.14 \, \text{A} \angle 45^\circ}$

d. $I_s = \frac{E}{Z_T} = \frac{60 \, \text{V} \angle 0^\circ}{1.52 \, \Omega \angle -38.89^\circ} = \mathbf{39.47 \, \text{A} \angle 38.89^\circ}$