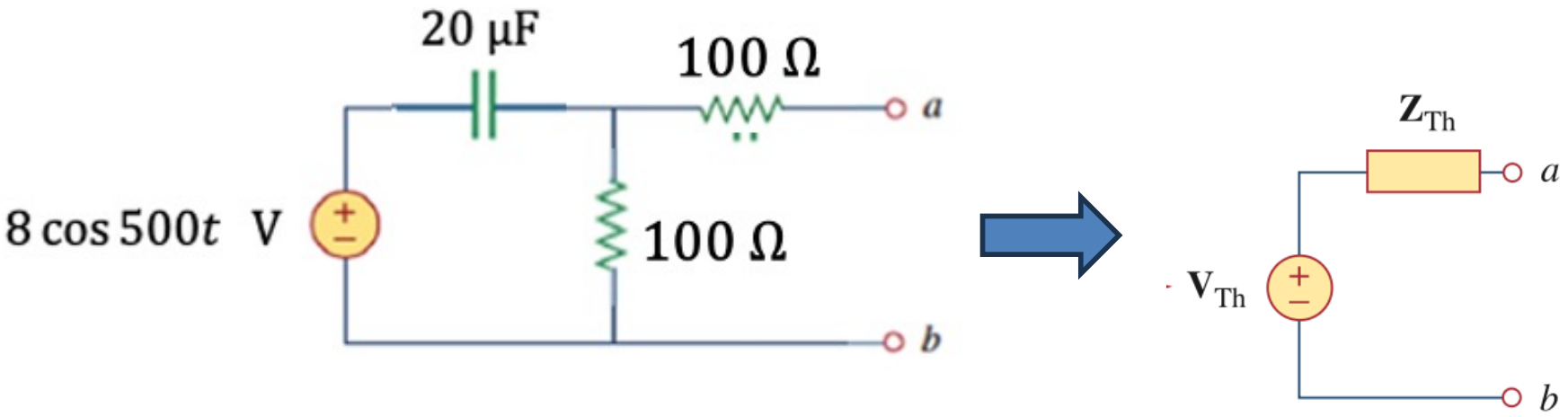
Lecture 28
Theorems – 5 of 6

Thevenin with phasors

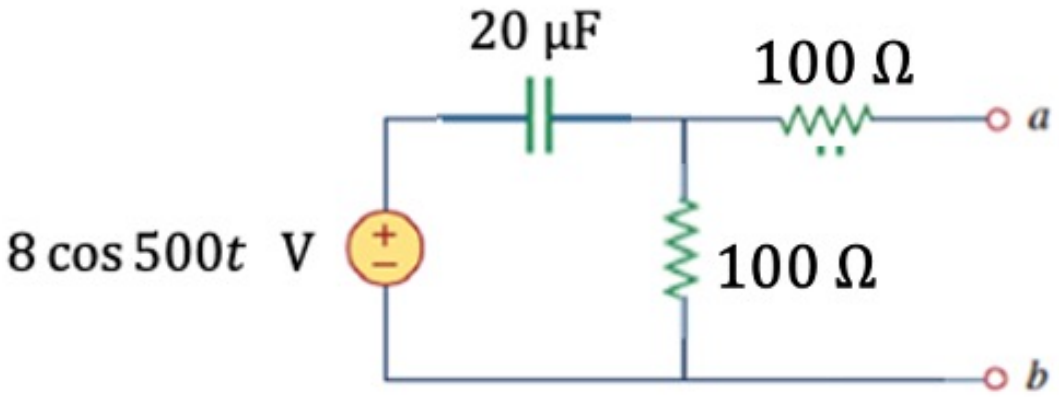
Thévenin and Phasors

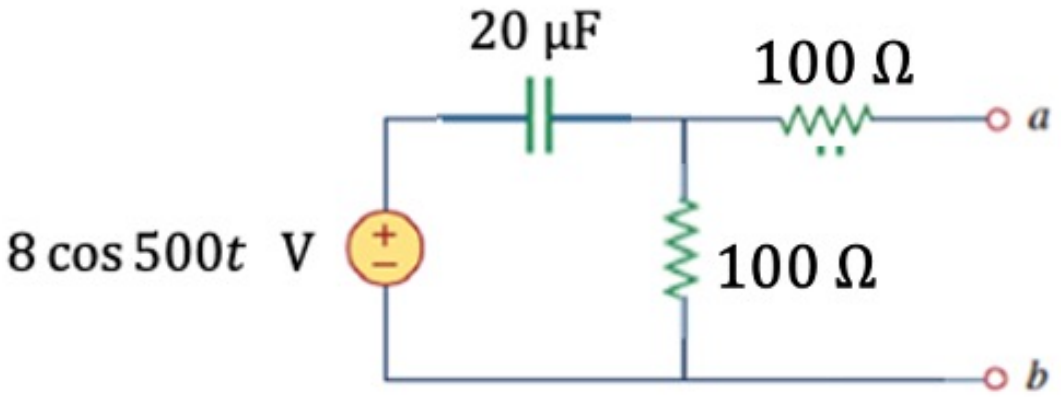


With

$$V_{TH} = A\cos(500\,t + \phi) \text{ volts}$$

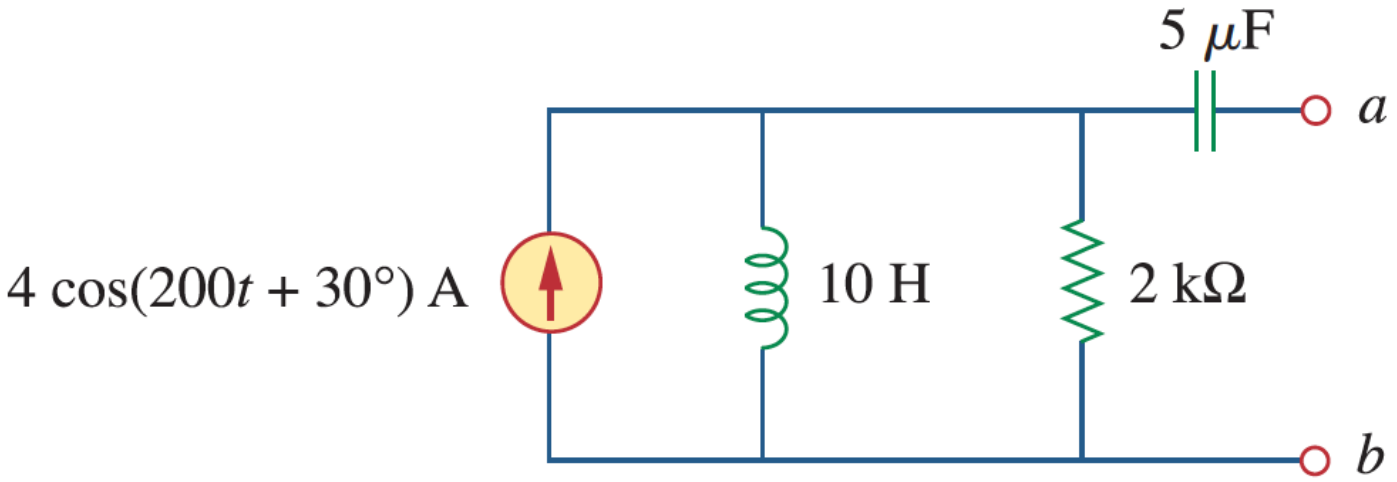
$$Z_{TH} = \begin{cases} \text{series resistor and inductor} & imag > 0 \\ \text{series resistor and capacitor} & imag < 0 \end{cases}$$

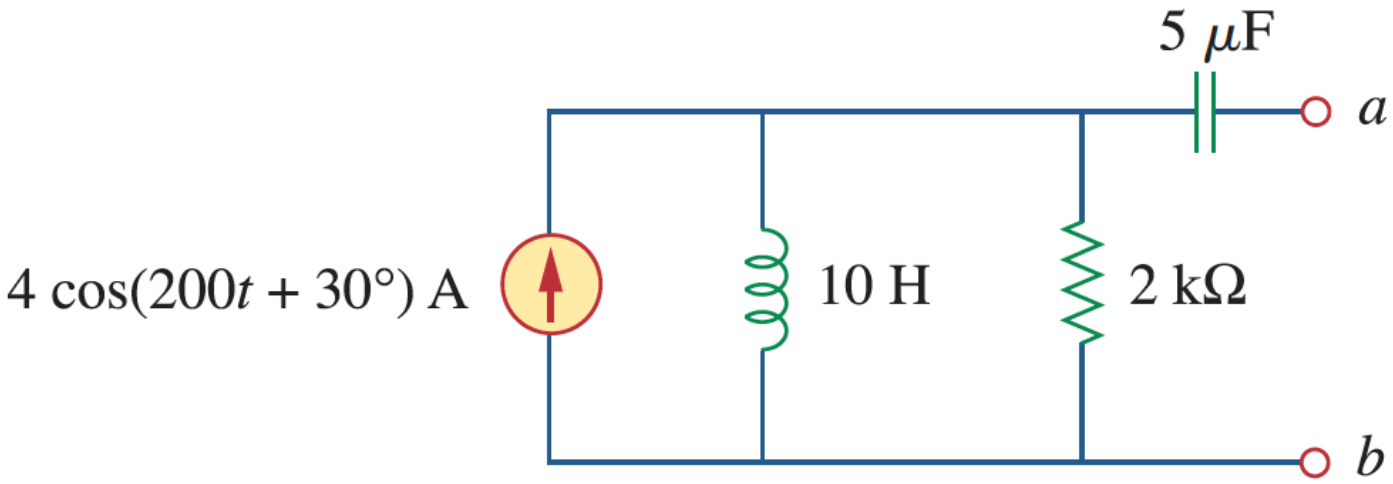

20 μF
100 Ω
a
8 cos 500t V
100 Ω
b

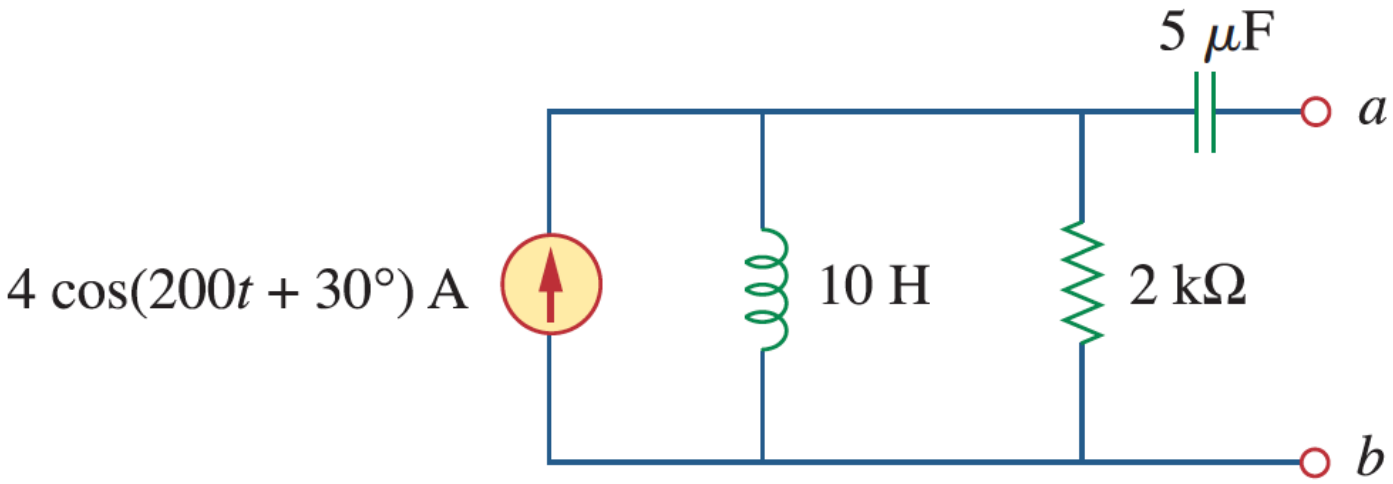


$4\sqrt{2}\ \cos(500t + 45°)\ V,$
$150\ \Omega, 40\ \mu F$

Example: find the Thevenin and Norton models

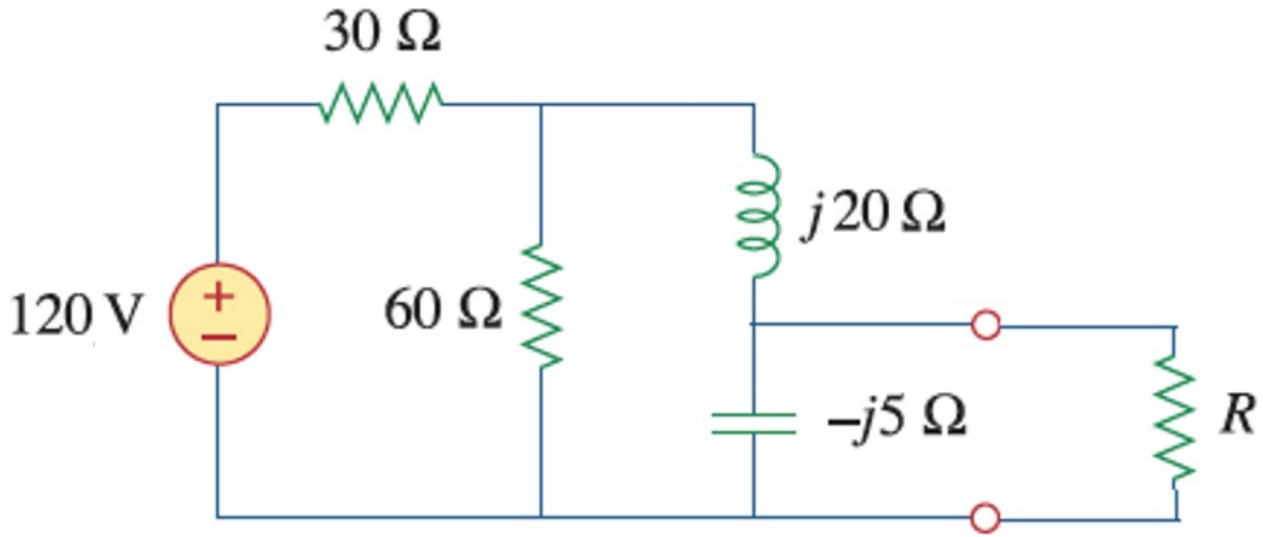


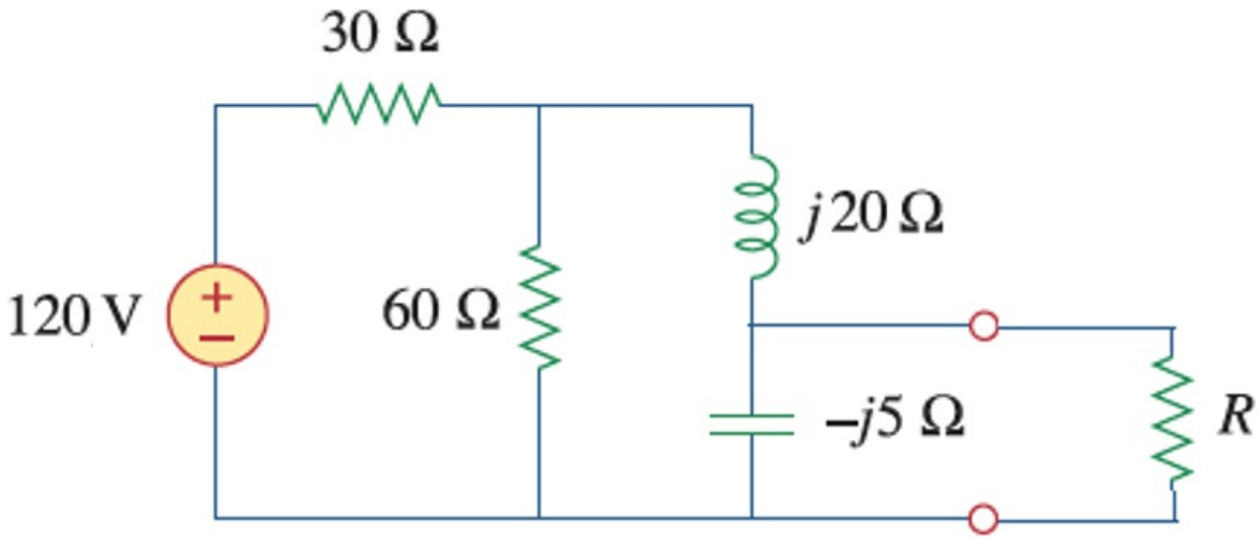

5 μF
a
4 cos(200t + 30°) A
10 H
2 kΩ
b

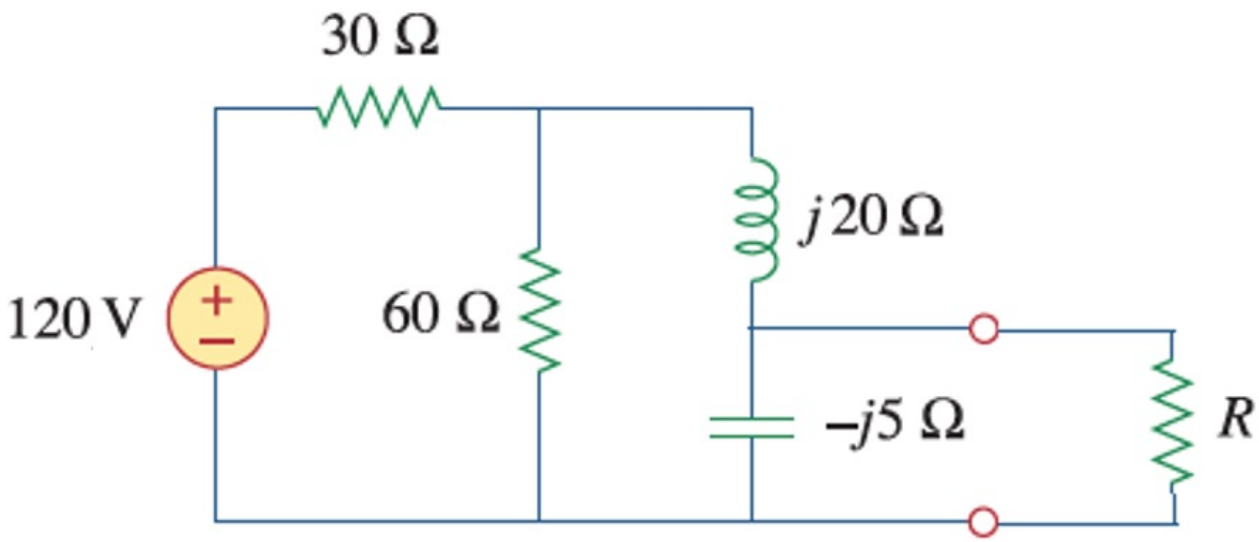


$4000\sqrt{2}\cos(200t + 75°)\ V,$
$1000\ \Omega,$
$4\sqrt{2}\cos(200t + 75°)\ A$

Example: find the magnitude of the current through R as a function of R – hint: first find the Thevenin equivalent

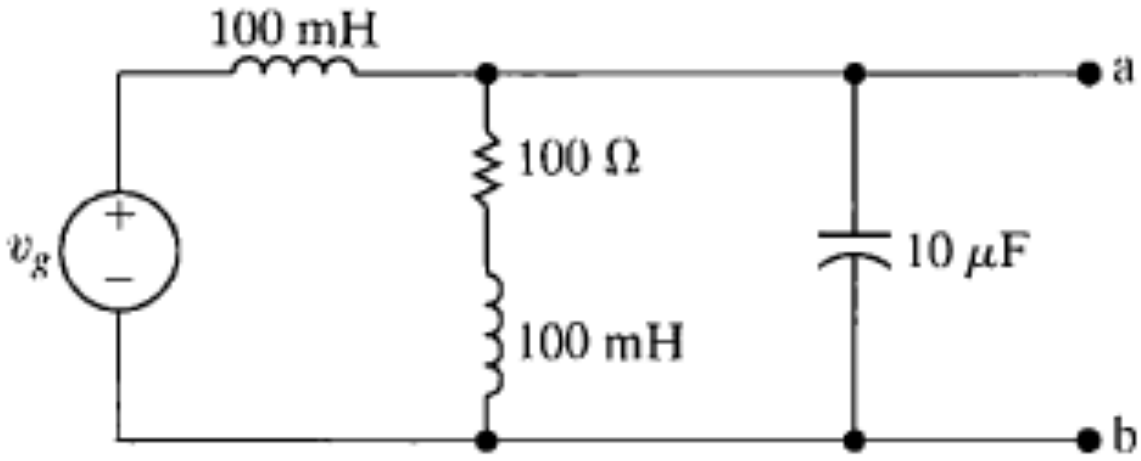



30 Ω
j 20 Ω
120 V
60 Ω
−j5 Ω
R



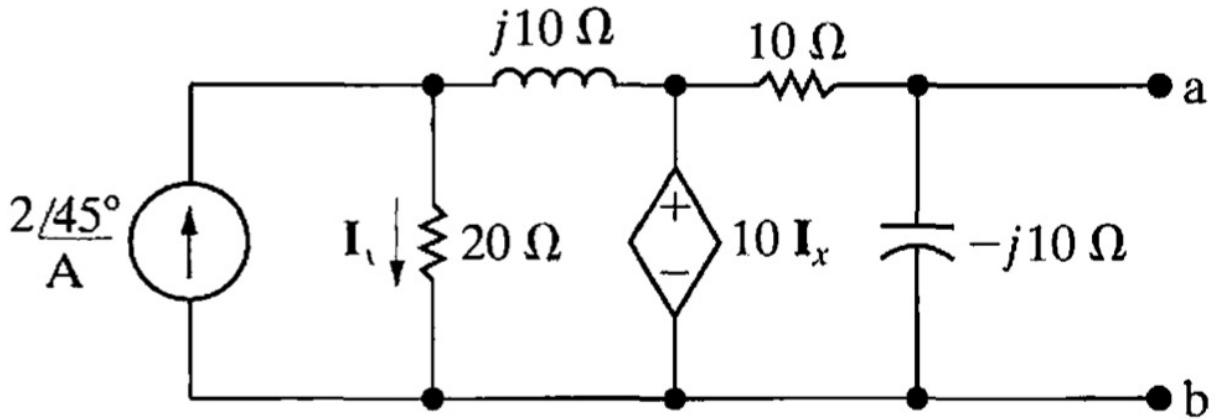
$$\frac{16}{\sqrt{(R+0.8)^2+5.6^2}}$$

Practice problem: find the Thevenin and Norton models if $v_g(t) = 247.49 \cos(1000t + 45°)$ V



$350 \cos 1000t \ V,$
$100\ \Omega, 100\ mH,$
$2.475 \cos(1000t - 45°)\ A$

Practice problem: Find V_{Th} and Z_{Th} in phasor form



$10\ \angle 45°\ V, 5 - 5j\ \Omega$