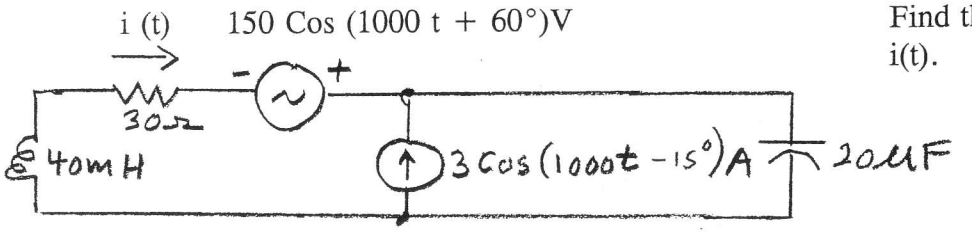
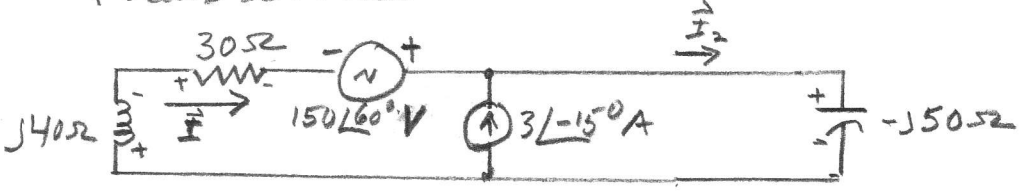
ECE 252 | **Introduction to Electrical Engineering** | **Quiz 11P**
100 Points | **Show your work.** | **Practice Solution**



Find the steady state value of i(t).

$j\omega L = j(1000)(.04) = j40\Omega$ $\quad \frac{1}{j\omega C} = \frac{1}{j(1000)(20\times10^{-6})} = -j50\Omega$

Transformed Circuit:



KVL: $j40\vec{I} + 30\vec{I} - 150\angle 60° + (-j50)\vec{I}_2 = 0$

KCL: $-\vec{I} - 3\angle -15° + \vec{I}_2 = 0$

$\therefore \vec{I}_2 = \vec{I} + 3\angle -15°$

Substituting into KVL:

$j40\vec{I} + 30\vec{I} - 150\angle 60° - j50(\vec{I} + 3\angle -15°) = 0$

$j40\vec{I} + 30\vec{I} - 150\angle 60° - j50\vec{I} - j150\angle -15° = 0$

$\vec{I}(30 + j40 - j50) = 150\angle 60° + j150\angle -15°$ $\quad (j = 1\angle 90°)$

$$\vec{I} = \frac{150\angle 60° + 150\angle 75°}{30 - j10} = \frac{(75 + j129.9) + (38.8 + j144.9)}{30 - j10}$$

$$= \frac{113.8 + j274.8}{30 - j10} = \frac{297.4\angle 67.5°}{31.6\angle -18.3°} = 9.41\angle 85.8° \text{ A}$$

Transforming back to time domain:

$$i(t) = 9.41\cos(1000t + 85.8°)\text{ A}$$