Driven LRC and transformers

1. The primary coil of a transformer has 100 turns and is driven by external AC source with $V_{1,RMS} = 110\,V$, $f_d = 60\,\text{Hz}$ and has current $I_{1,RMS} = 1\,A$. The secondary coil is to supply $V_{2,RMS} = 10\,V$.

   (a) find the frequency in the secondary coil

   (b) find the current

   (c) find the number of secondary turns.

2. A series RLC circuit is driven by an external AC source with $\mathcal{E} = \mathcal{E}_m \sin(\omega_d t)$. Use $R = 1\,\Omega$, $L = 10\,mH$, $C = 0.7\,mF$, $\mathcal{E}_{rms} = 150\,V$, $f_d = 60\,Hz$.

   (a) find ω_d

   (b) find the inductive reactance X_L

   (c) find the capacitive reactance X_C

   (d) find the impedance Z

   (e) find the current I_{rms}

   (f) find the average power P

   (g) find the phase shift ϕ and the power factor $\cos\phi$

   (h) suppose, L can be varied; which value would bring the circuit into resonance?

   (i) what will be the impedance Z at resonance?

   (j) Plot $I(L)$