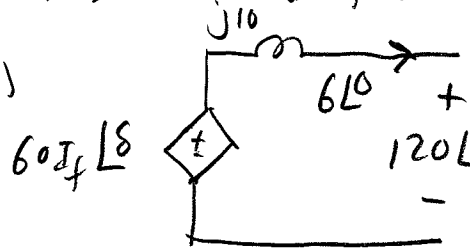
ECE431 Exam 2, Spring 2006 Solution

#1. $K_f w_s \times 2 = 120$, $K_f w_s = 60\Omega$, $60 \times 1 = 6 X_s$, $X_s = 10\Omega$

(a)



$60 I_f \angle\delta = 60\angle 90 + 120 = 120 + j60 = 134\angle\delta$

$I_f = 2.23$ Amps

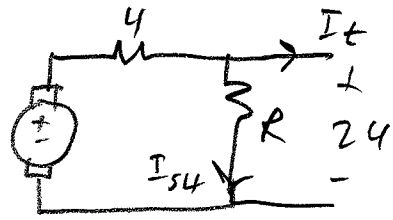
(b) $\delta = 90°$ $\quad 2100 = \frac{3 \times 120 \times 60 I_f}{10}$ $\quad I_{f_{min}} = 0.97$ Amps

#2. $K_f w_s \times 3 = 120$, $K_f w_s = 40\Omega$ $\quad 40 \times 2\angle 0 = jX_s\, 5\angle\theta + 120\angle 0$

$80 = 5X_s \angle 0 + 120$ $\quad X_s = 8\Omega$

$P_{max\ sudden} = \frac{3 \times 120 \times 40 \times 2}{8} \sin 46° = 2590$ W

#3. (a)



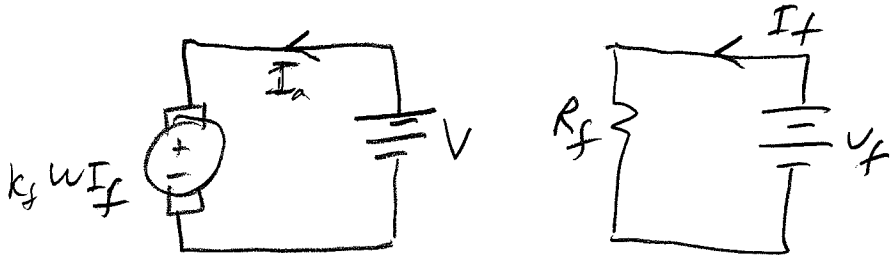
$I_t = 0$ $\quad 14 + 180 I_{SH} = 4 I_{SH} + 240$

$I_{SH} = 1.28\Omega$ $\quad R = \frac{240}{1.28} = 187\Omega$

(b) $(14 + 180 I_{SH})\frac{1050}{1100} = 4\left(\frac{6000}{240} + I_{SH}\right) + 240$ $\quad I_{SH} = 1.95$

$R = \frac{240}{1.95} = 123\Omega$

#4. neglect R_a & λ_R



$V = K_f w I_f$

$T = \frac{E_a I_a}{w} = K_f I_f I_a$

(a) V=const, I_f = double → w = half, T=const → I_a = half

(b) V = half I_f = const → w = half, T=const → I_a = constant

(c) V = half I_f = const → w = half, T = 1/4 → I_a = quarter

(d) V = half I_f = const → w = half, $P = K_f w I_f I_a$ = const → I_a = double

(e) V = half I_f = half → w = const, P = const → I_a = double