電路學期末考

1. For the circuit shown in Fig. 1, find v_x as a function of v_s. (10%).
2. For the circuit shown in Fig. 2, find v_1, v_2 and i_a. (15%)
3. The switch in Fig. 3 is closed at $t = t_0$, when there is no stored energy.
   (a) Find the value of the stored energy and v_1 at $t >> t_0$, when the circuit is in the dc steady state. (16%)
   (b) Assume that the dc voltage source is replaced by an ac voltage source $50\cos 100t$, $t \geq t_0$, find $i_1(t)$ in the ac steady state. (9%) (*Note: Exact numerical results are not required. Use symbols such as* $\sqrt{\ }$ *and* $\tan^{-1}$ *when appropriate.*)
4. Assume a value for $\underline{V}_2$ in Fig. 4 to calculate $\frac{\underline{I}_2}{\underline{I}}$ and $\frac{\underline{V}_1}{\underline{I}}$ in polar form when R=5Ω and $\underline{V}_x = 2\underline{V}_2$. (14%)
5. An ac motor having impedance $Z_M = 3.6 + j4.8\ \Omega$ is supplied from a 240V(rms), 60Hz source.
   (a) Calculate power factor, $\underline{I}$, P, Q. (16%)
   (b) The power factor will be corrected to unity by connecting a capacitor in parallel with the motor. Find C and the power P and current $\underline{I}$ supplied by the source. (15%)
   (c) Calculate the voltage $\underline{V}_M$ across the motor. (5%)

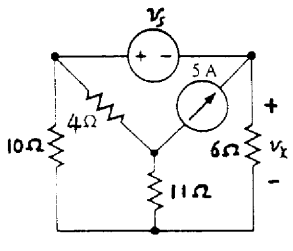

Fig. 1

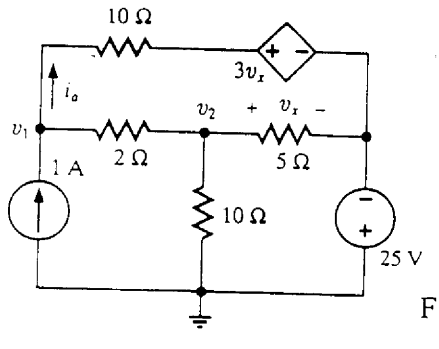

Fig. 2

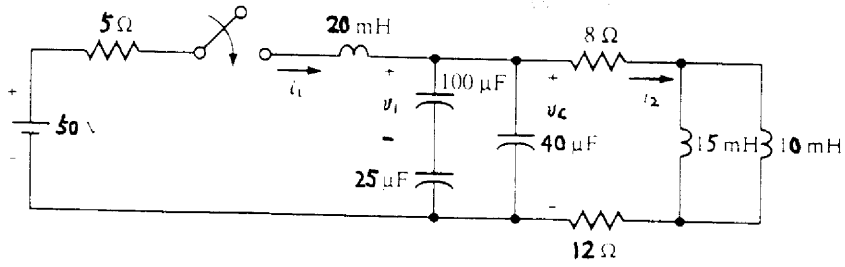

Fig. 3

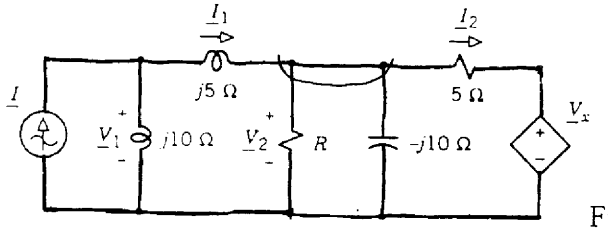

Fig. 4