

國立台灣科技大學九十五學年度碩士班招生試題

系所組別：電機工程系碩士班甲組

科目：電路學

總分一百分

1. Calculate the mesh current in the circuit of Fig. P1. (15 %)

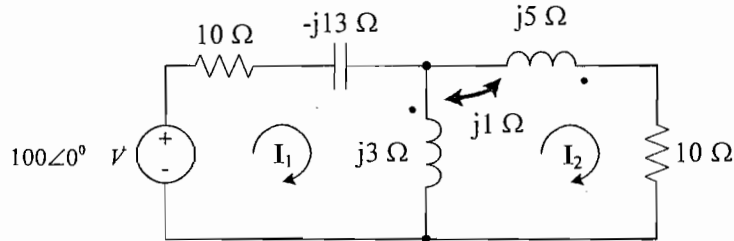


Fig. P1

2. For the circuit shown in Fig. P2. (Total 25 %)
- (a) Find the state-space representation of the circuit using $v_i(t)$ as input. (10 %)
- (b) Given the transfer function $H(s) = \frac{V_o(s)}{V_i(s)} = \frac{10}{s^2 + 3s + 10}$, realize the function using this circuit. (Assume $R=5 \Omega$) (15 %)

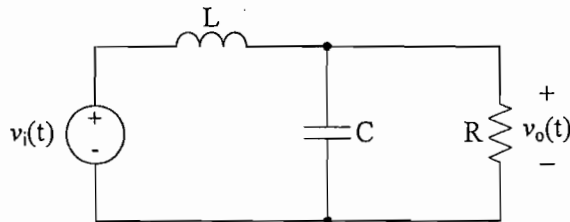


Fig. P2

3. For the ideal op amp shown in Fig. P3, assume $v_s(t) = e^{-5t}u(t)$ and zero initial condition, find $v_o(t)$ for $t > 0$ (10%)

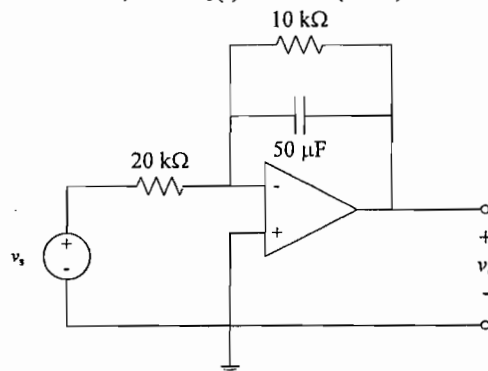


Fig. P3



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4. Consider the circuit of Fig. P4. If $i_s(t) = 40 \cos(1000t) \mu\text{A}$, $C_1 = 1\text{nF}$, $C_2 = 0.1\text{nF}$, $g_m = 0.1\text{mS}$, and $R_1 = R_2 = 100\text{k}\Omega$, find the Thevenin equivalent circuit parameters of V_{oc} and Z_{th} . (15%)

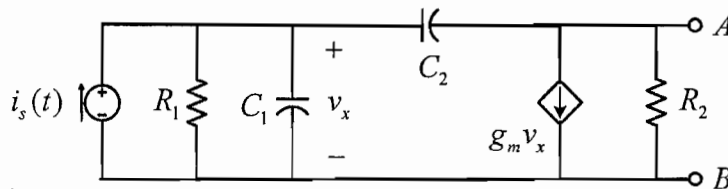
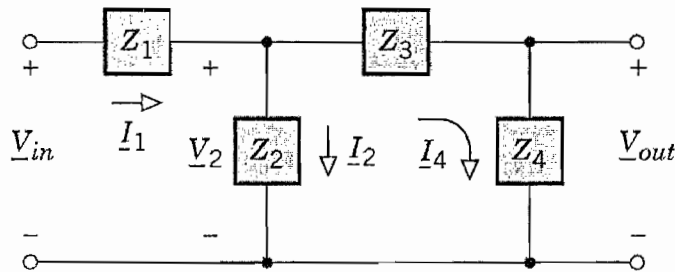


Fig. P4

5. A group of three-phase induction motors is drawing 7 kW from a 240-V, 60-Hz powerline at a pf. of 0.65 lagging. Find: (15%)
- The equivalent line current drawn by the equivalent motors.
 - The total complex power absorbed by the motors.
 - The equivalent capacitance of a capacitor bank needed to raise the pf. to 0.8 lagging?
6. For the network and conditions shown in Fig. P6, if the input source is $v(t) = 110\sin(377t + 0^\circ)$, find:
- the transmission parameter matrix $ABCD$. (10%)
 - the output voltage V_{out} . (10%)



$$Z_1 = 1/sC_1, Z_2 = R, Z_3 = 1/sC_3 \text{ and } Z_4 = R \text{ and } C_1 > C_3$$

$$R = 5\Omega, C_1 = 16 \mu\text{F}, C_3 = 600 \text{ pF}$$

Fig. P6

