

國立臺灣科技大學九十八年度電力電子產業研發碩士專班招生(秋)試題

系所組別：電力電子領域

科目：電路學

(總分為 100 分)

1. Obtain v_1 and v_2 in the circuit of Fig. P1 (10 %)

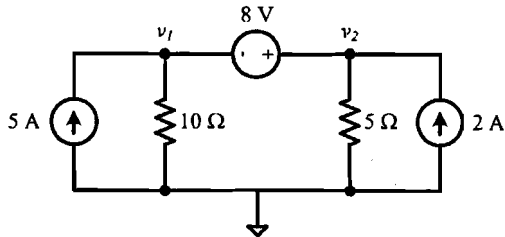


Fig. P1.

2. Find the value of R_L for maximum power transfer in the circuit of Fig. P2. Also find the maximum power. (15 %)

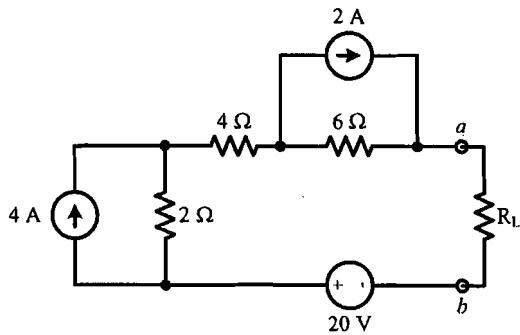


Fig. P2

3. Simply explain the operating principle and the application of the OP AMP circuits shown in Fig. P3 (Assuming the OP AMP is ideal) (10 %)

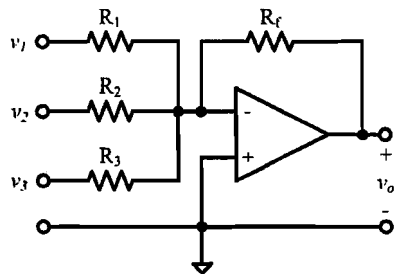


Fig. P3

4. Find the complete response $v(t)$ and $i(t)$ for $t > 0$ in the circuit of Fig. P4, assuming that the circuit reaches its steady state before $t = 0$. (15 %)

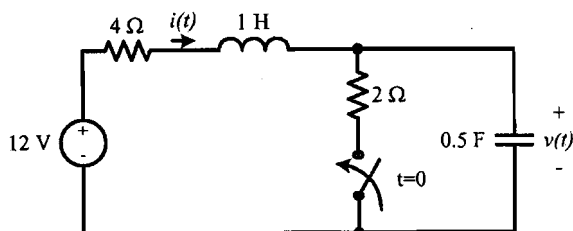


Fig. P4

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5. Shown in Fig. P5 is the phasor circuit of a series resonant circuit. (20 %)

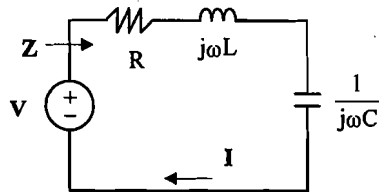
(a) The resonant frequency, ω_0 , is defined as the frequency when the imaginary part of the impedance Z is zero. Please show that $\omega_0 = \frac{1}{\sqrt{LC}}$.(b) The bandwidth, BW, is defined as the difference between the two half-power frequencies. Please show that $BW = \frac{R}{L}$.

Fig. P5

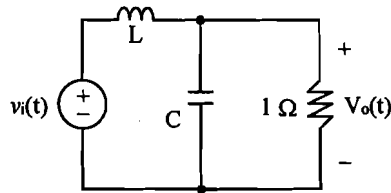
6. Given the voltage gain transfer function $\frac{V_o(s)}{V_i(s)} = \frac{10}{s^2 + 3s + 10}$, realize the function using the circuit in Fig. P6. (20 %)

Fig. P6

7. The voltage $v = 12 \cos(60t + 45^\circ)$ is applied to a 0.1-H inductor. Find the steady-state current through the inductor. (10 %)