

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Refer to the circuit of Fig. 1. Calculate:

- (a) the line currents in phasor domain representation, (10%)
- (b) the real power absorbed by the load, (5%)
- (c) and the total complex power supplied by the source. (5%)

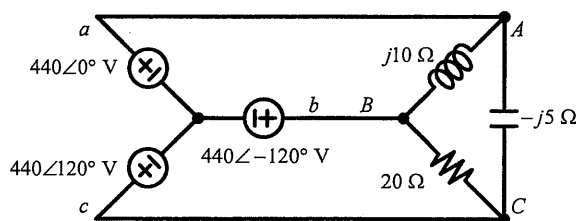


Fig. 1

2. Let $i_s = 5\cos(100t)$ A as shown in Fig. 2. Calculate:

- (a) the voltage across the capacitor, v_c , (10%)
- (b) and the value of the energy stored in the coupled coils at $t = 2.5\pi$ ms. (5%)

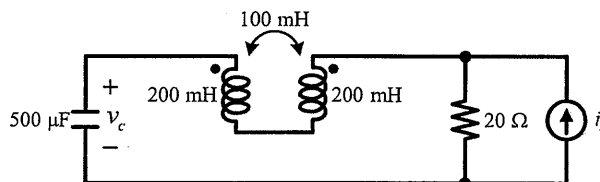


Fig. 2

3. A general first-order filter is shown in Fig. 3.

- (a) Find the transfer function v_o/v_s . (5%)
- (b) What condition must be satisfied for the circuit to operate as a high-pass filter? Sketch the magnitude and phase Bode plots, and label the corresponding high-frequency gain and the cutoff frequency. (5%)
- (c) What condition must be satisfied for the circuit to operate as a low-pass filter? Sketch the magnitude and phase Bode plots, and label the corresponding DC gain and the cutoff frequency. (5%)

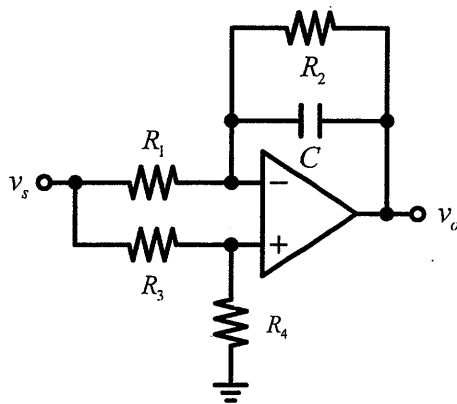


Fig. 3

4. A mechanical system is modeled by an equivalent series RLC circuit. It is desired to produce an overdamped response with time constants 0.1 ms and 0.5 ms. If a series resistor R of 120Ω is used, find the values of L (in mH) and C (in μF). (20%)
5. Find the equivalent capacitance of C_{ab} (in μF) as seen from terminals a - b in the circuit of Fig. 5. (20%)

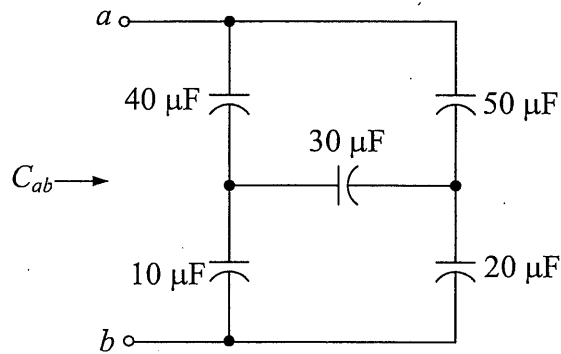


Fig. 5

6. For the ideal op amp circuit shown in Fig. 6, all voltages are in V and all resistors are in Ω . Obtain the expression for the transfer function of $k = v_o/v_{in}$. (10%)

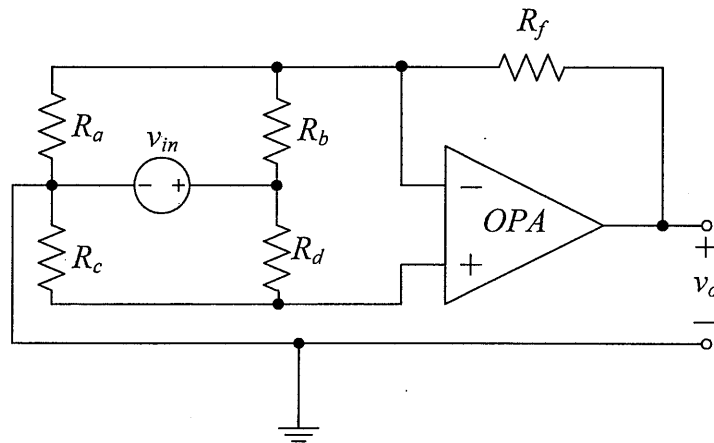


Fig. 6