1. Find $i_o(t)$, $t > 0$ for the circuit in Fig. 1. [15%]

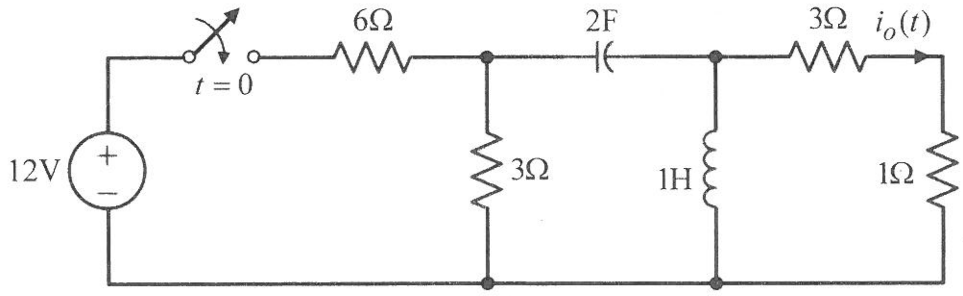

Fig. 1

2. Given the circuit in Fig. 2, design a second-order bandpass filter with a center frequency gain of -5, ω_0 =10 krand/s, and a BW = 2 krad/s. Let $C_1 = C_2 = C$ and $R_1 = 1\text{k}\Omega$, find (a) C; (b) R_2; (c) R_3; and (d) Q of this filter. Assume that the op-amp is ideal. [20%]

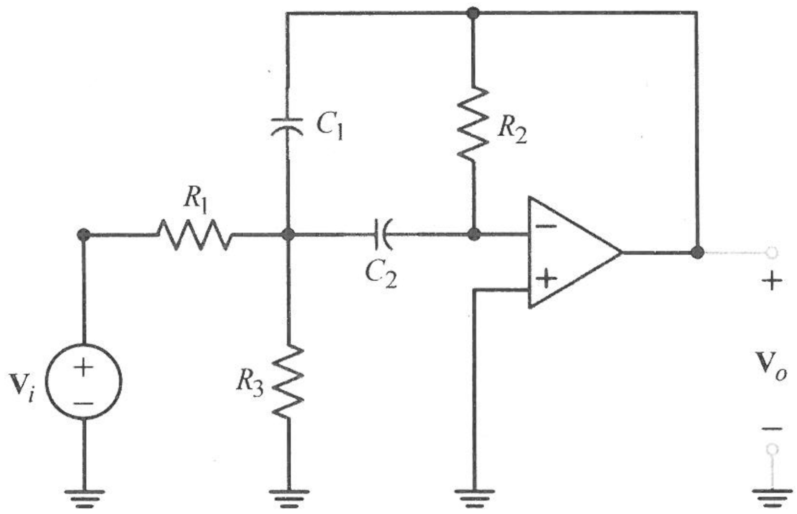

Fig. 2

3. Find the value of C in the network in Fig. 3 such that the total load has a power factor of 0.95 lagging. [10%]

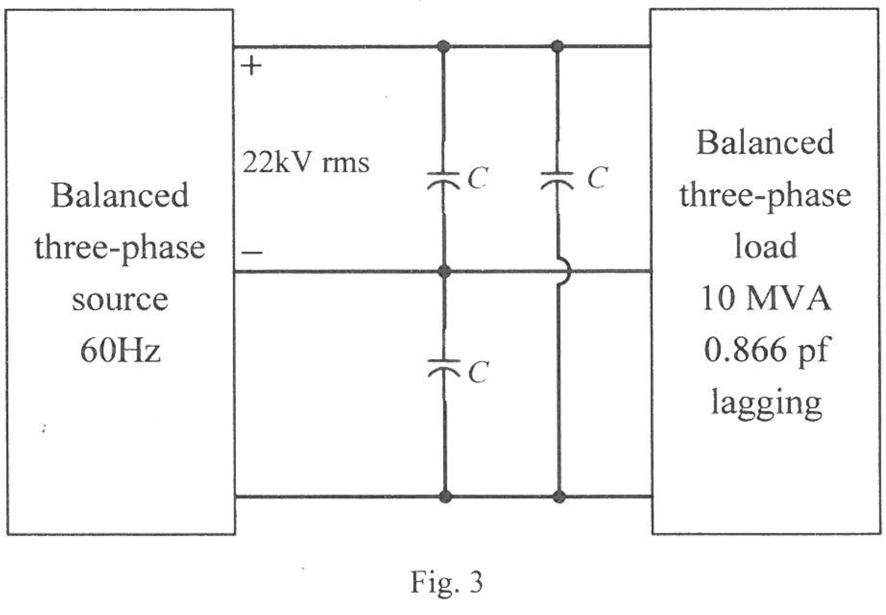

Fig. 3

4. Find $v_o(t)$ and $i_o(t)$ in Fig. 4.[10%]

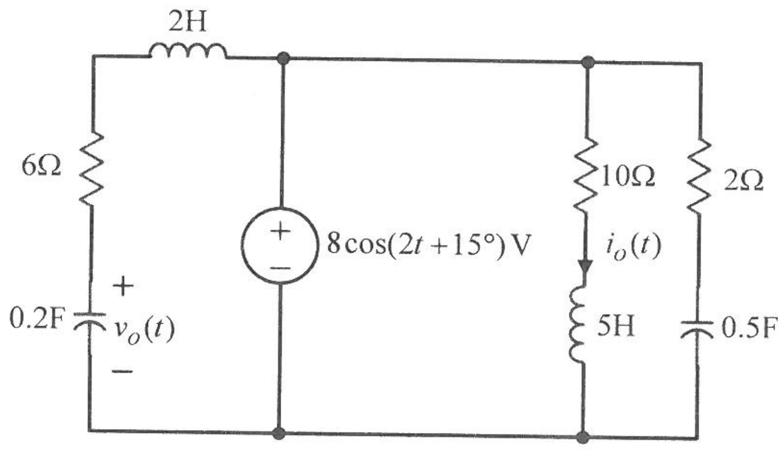

Fig. 4

5. Use **Thèvenin's theorem** to find V_o in Fig. 5. [15%]

6. Find V_o and the loop currents I_1, I_2, I_3 in Fig. 6 using **loop analysis**. [20%]

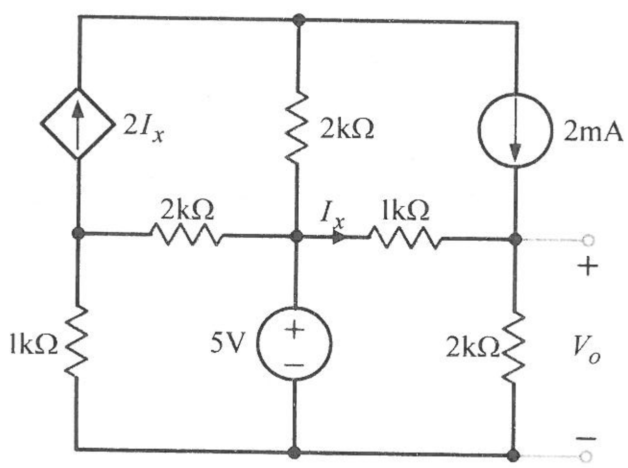

Fig. 5

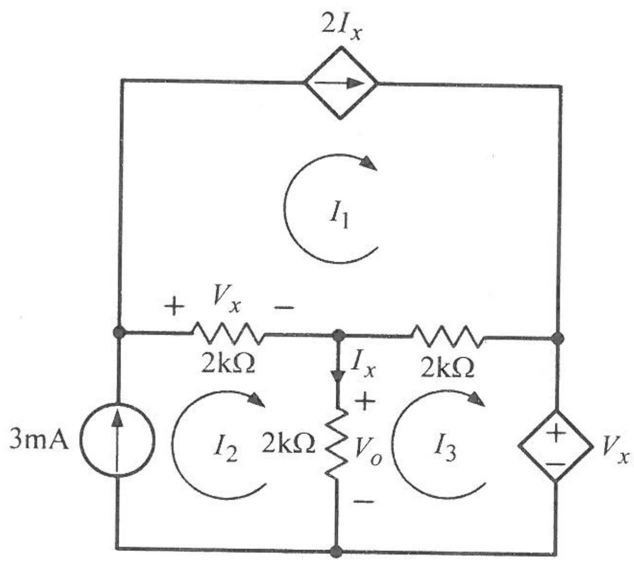

Fig. 6

7. In a balanced three-phase wye-wye system, the source is an *abc*-sequence set of voltages. The line impedance is $\mathbf{Z}_{line} = 6 + j10\Omega$ and the load impedance is $\mathbf{Z}_{load} = 12 + j6\Omega$. The load voltage on the phase-a is $\mathbf{V}_{AN} = 200\angle 20°$ Vrms. Find the line voltage $\mathbf{V}_{ab}$ of the source. [10%]