1. In Fig. 1, find R_L for maximum power transfer and the maximum power that can be transferred to the load. [20%]
2. Determine $\mathbf{I}_1$, $\mathbf{I}_2$, $\mathbf{V}_1$ and $\mathbf{V}_2$ in the network drawn in Fig. 2. [20%]
3. Determine $\mathbf{G}(j\omega)$ if its magnitude characteristic is shown in Fig. 3. [10%]
4. For the circuit shown in Fig. 4, find the output voltage $v_o(t), t>0$. Assume that the circuit has reached steady state at $t=0-$. [20%]
5. Design an op-amp based circuit to produce the following function: $V_o = 10V_1 - 6V_2$. [15%]
6. In a balanced three-phase system, the source has an *abc*-phase sequence and is connected in wye. There are two parallel wye-connected loads. The line impedance connecting the source to the loads is $0.2+j0.1\,\Omega$. The phase impedance of load 1 and load 2 is $3+j3\,\Omega$ and $8+j10\,\Omega$, respectively. If the current in the *a* phase of load 1 is $\mathbf{I}_{AN_1} = 12\angle 20°$ A rms. Find the phase voltages in the source. [15%]

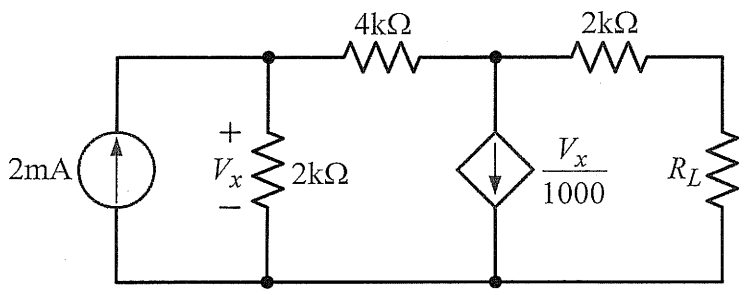

Fig. 1

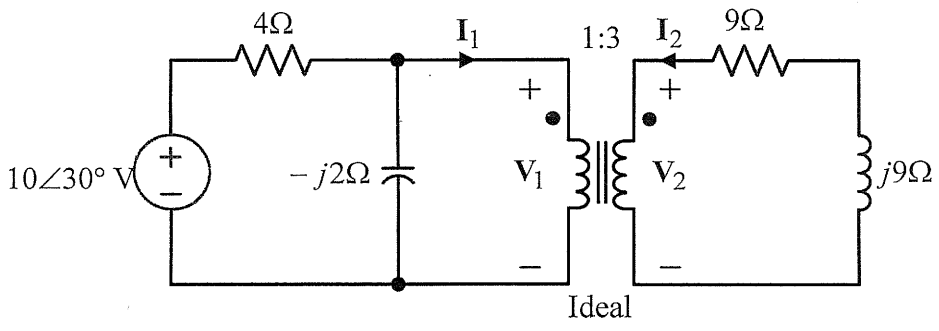

Fig. 2

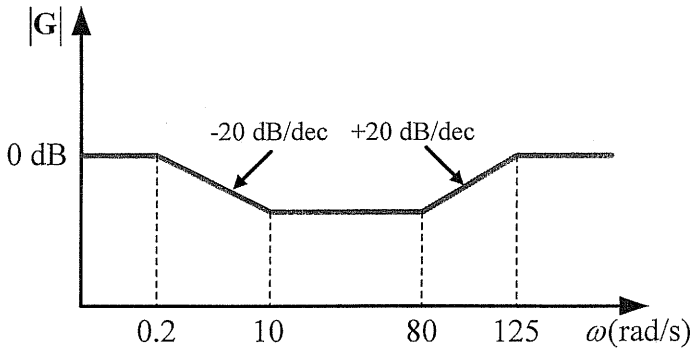

Fig. 3

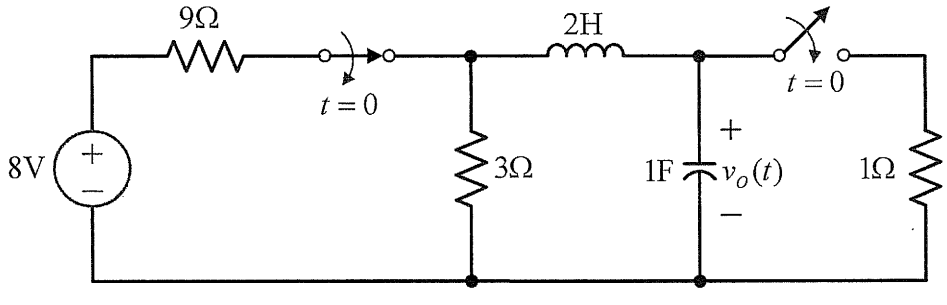

Fig. 4