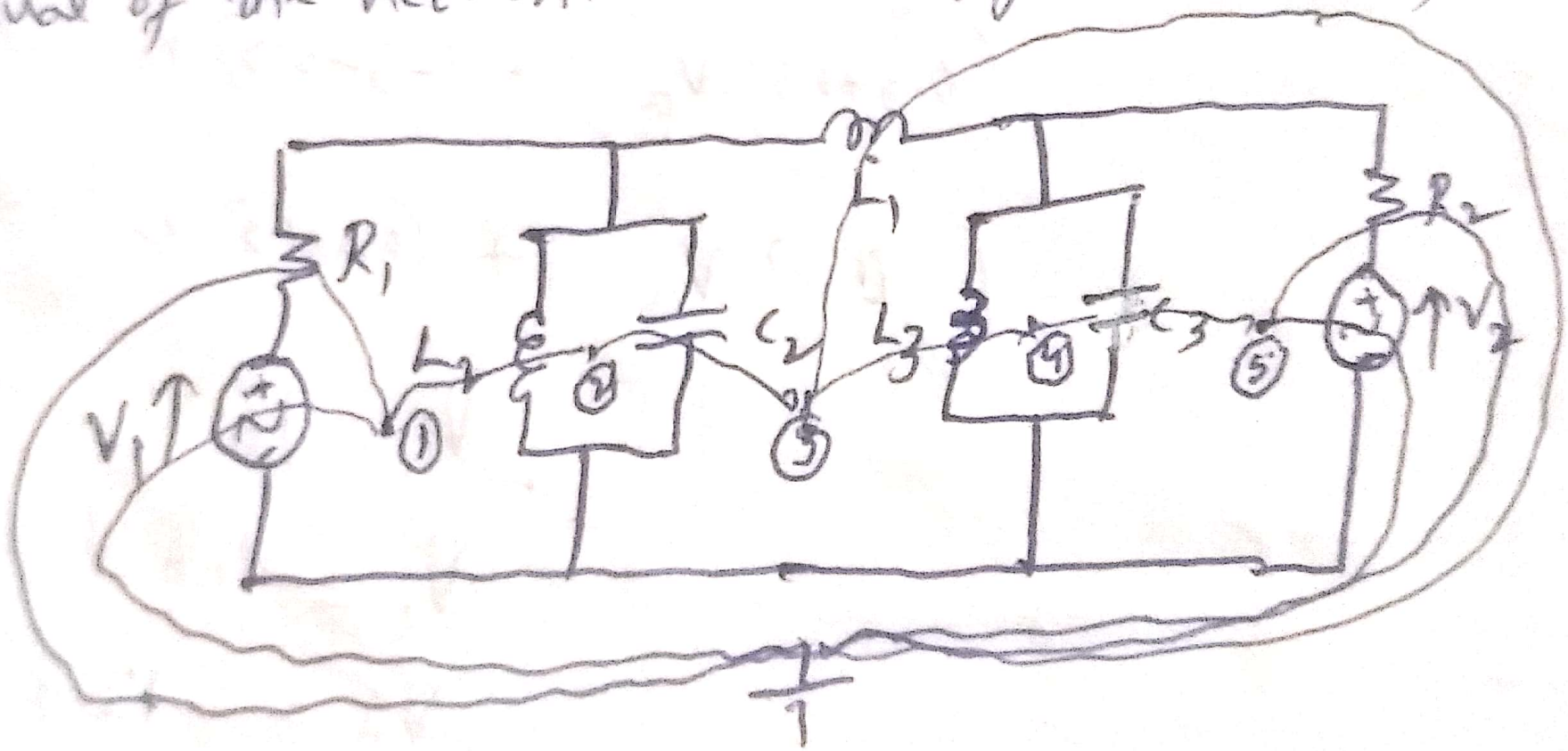
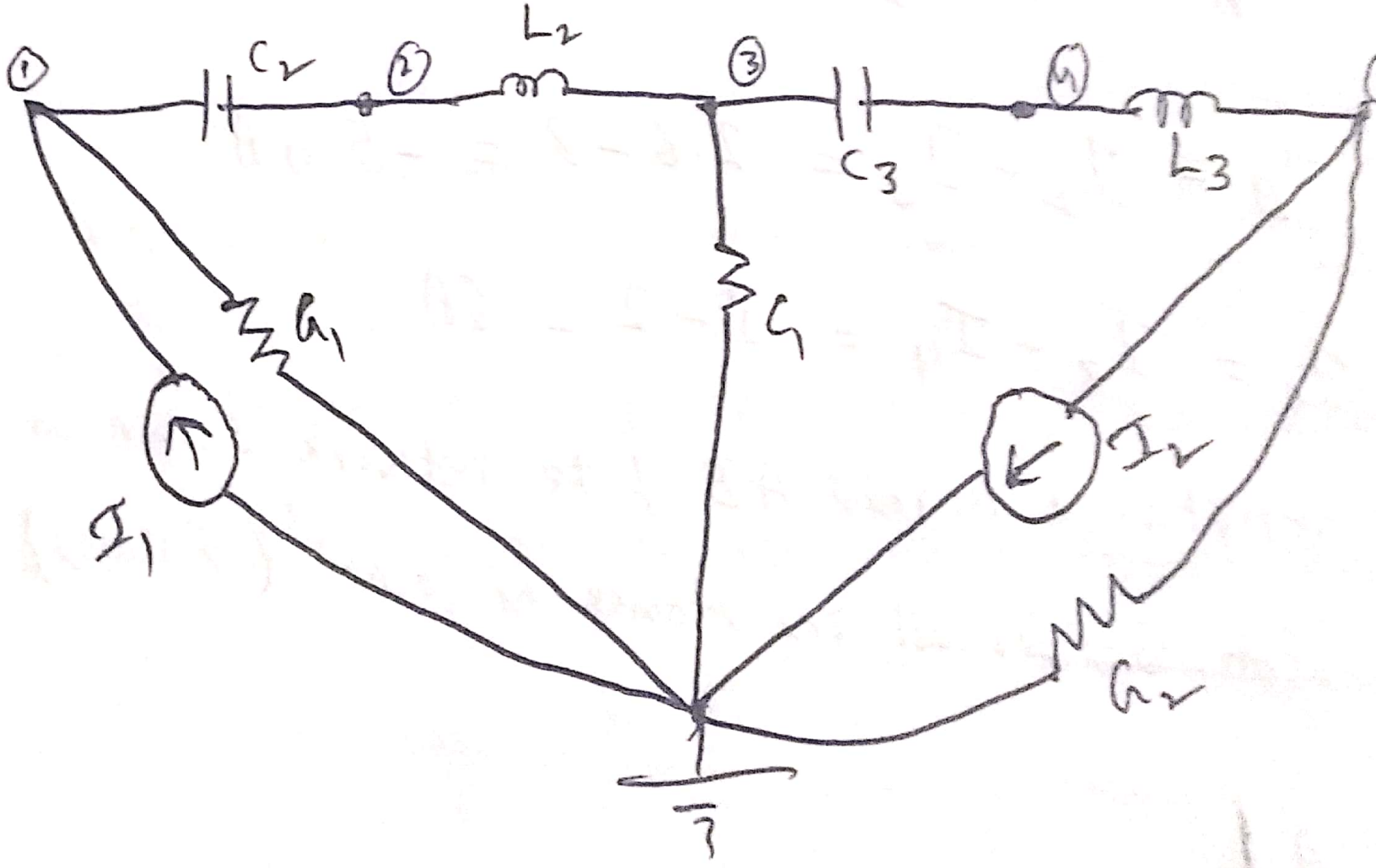
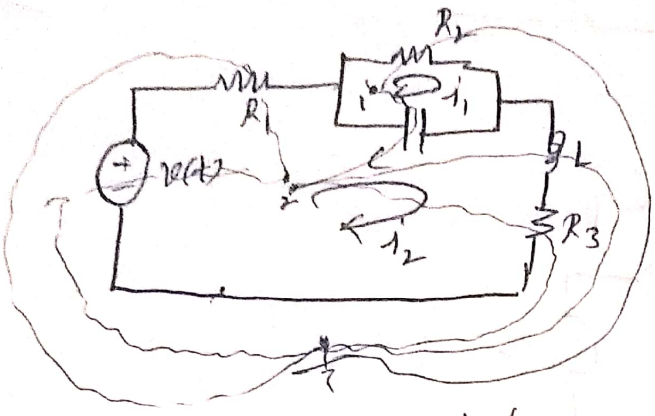
Draw the dual of the network shown in figure (4 marks)



Voltage Source in series with element will conceal current source in parallel with that element



b. Write the equilibrium equations using KVL for the network shown in figure. Draw its dual and also write its equilibrium equations. (5 Marks)

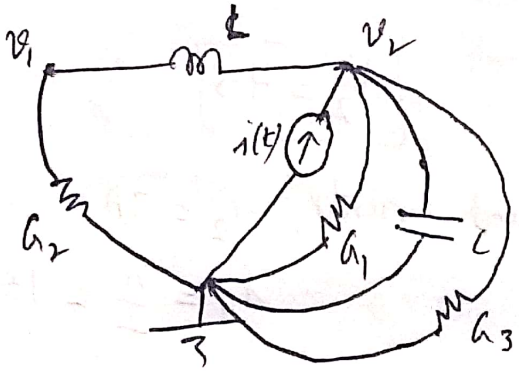


Equilibrium equations:

$$R_2 i_1 + \frac{1}{C}\int (i_1 - i_2)\,dt = 0 \qquad -①$$

$$R_1 i_2 + \frac{1}{C}\int (i_2 - i_1)\,dt + L\frac{di_2}{dt} + R_3 i_2 = v(t) \qquad -②$$

Dual network:



Equilibrium equations for the dual n/w

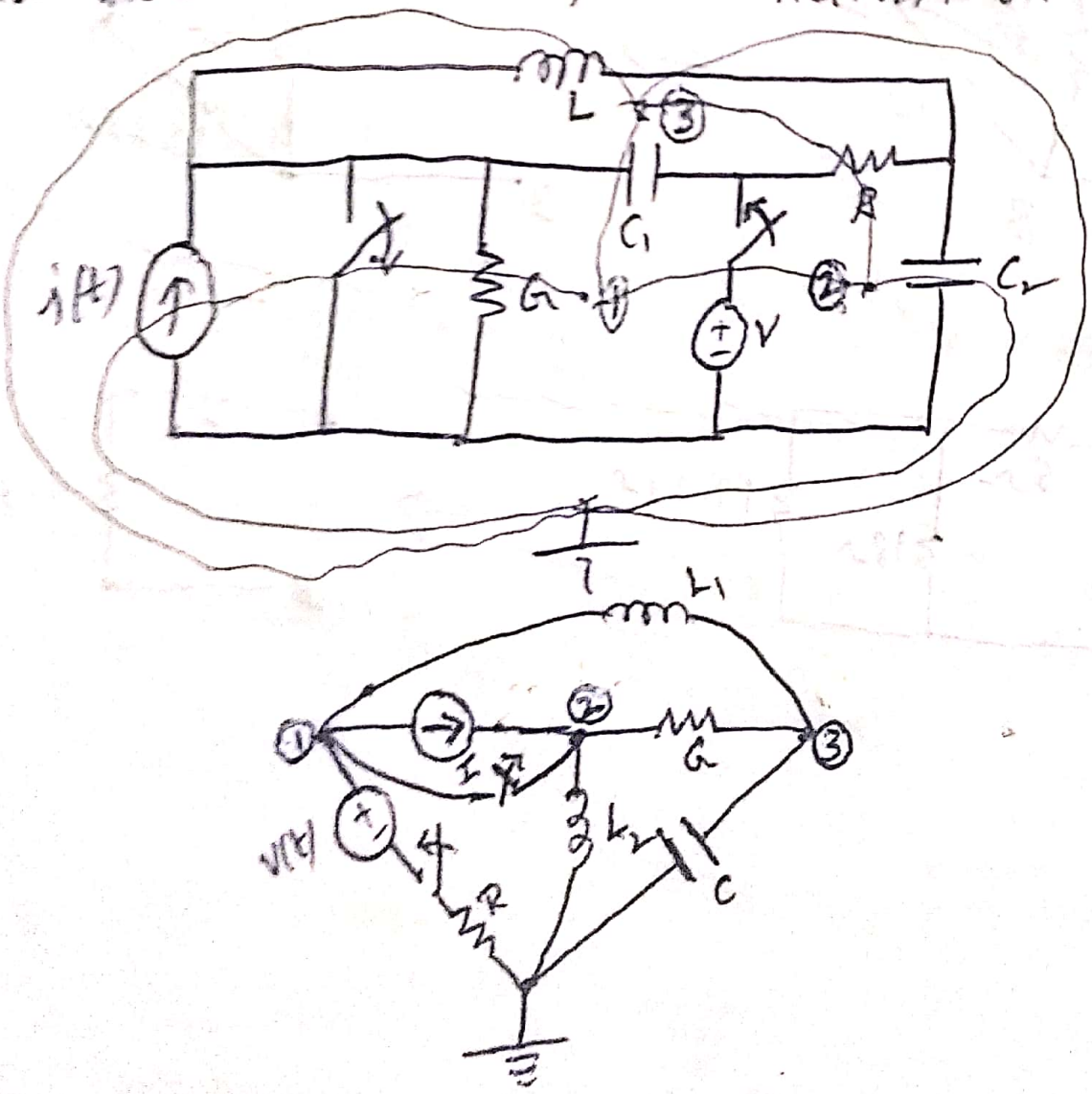
(Replace current by voltage & voltage by current in equations ① & ②

Replace
- R → G
- L → C
- C → L

$$G_2 v_1 + \frac{1}{L}\int (v_1 - v_2)\,dt = 0$$

$$G_2 v_2 + \frac{1}{L}\int (v_2 - v_1)\,dt + C\frac{dv_2}{dt} + G_3 v_2 = i(t)$$

c. Construct the dual network for the network shown in figure. (4 Marks) 12

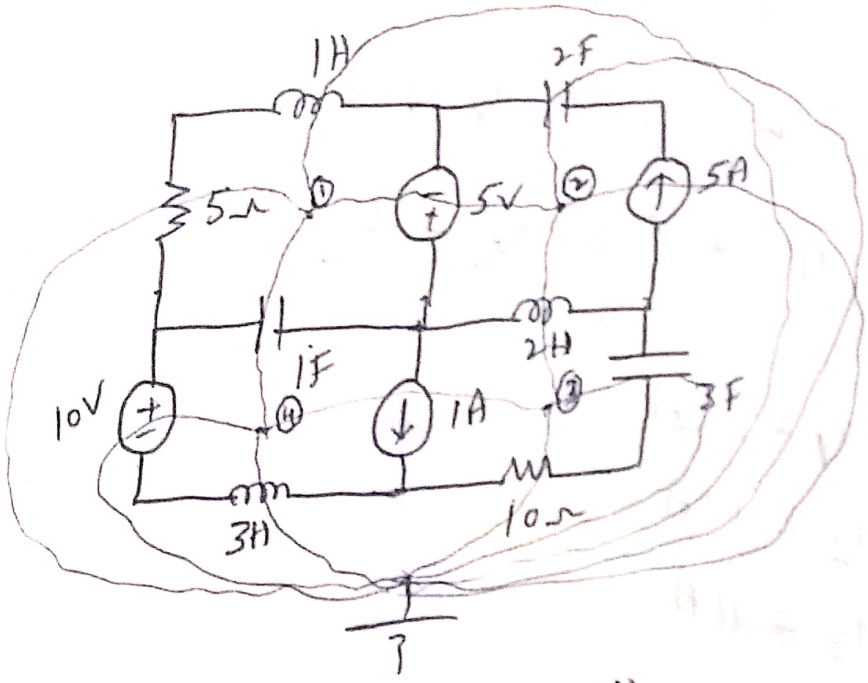


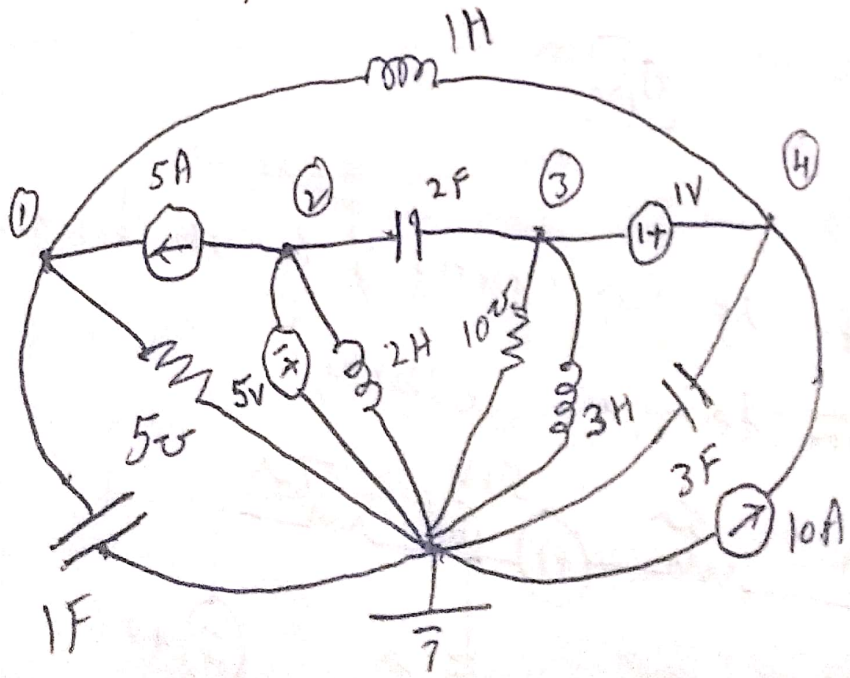
> $i(t)$ in parallel with open switch, G will come as $V(t)$ in series with close switch, R.

> V in series with close switch will come as I in parallel with open switch.

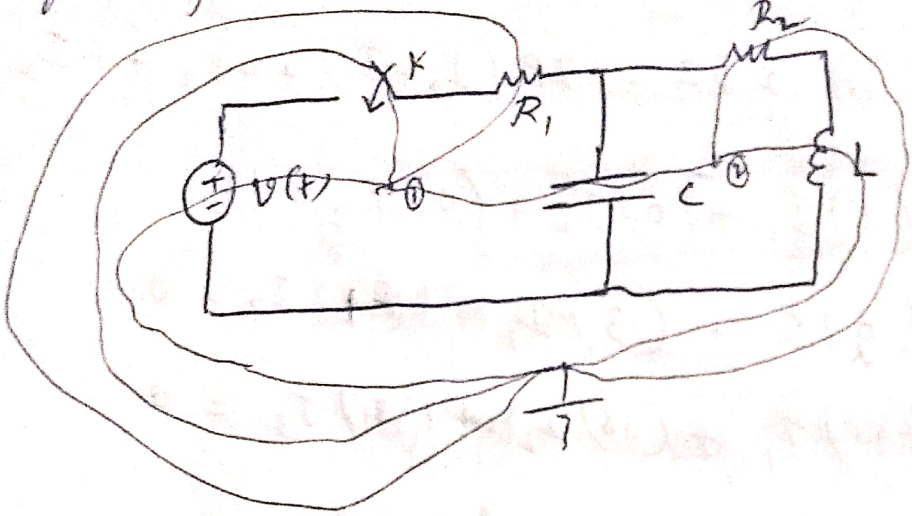
6. Construct the exact dual of the network shown in figure using dot method. L4
(8 Marks)

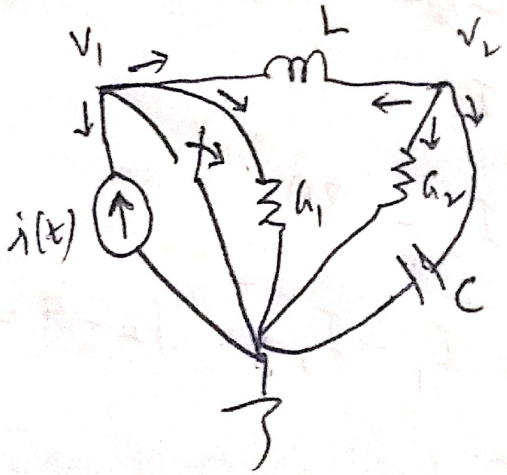
Sol:





. For the network shown in figure draw the dual of the circuit. Also write the nodal equations for the dual network (8 marks)





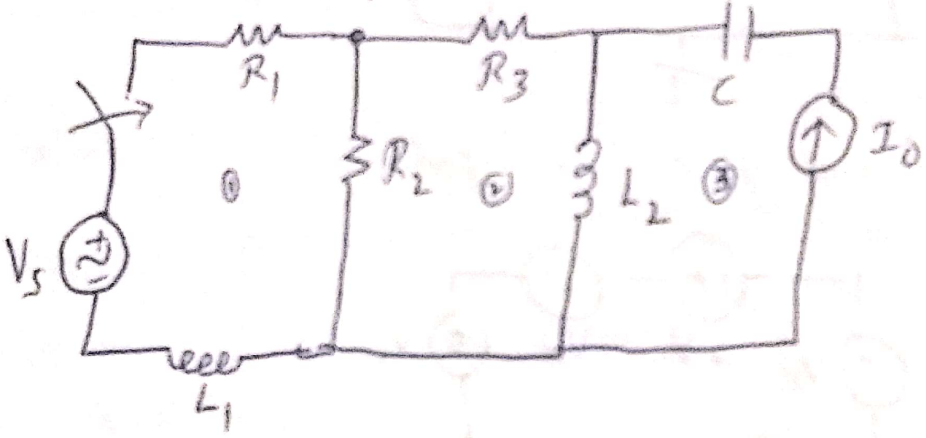
Nodal equations :

$$V_1 G_1 + \frac{1}{L}\int (V_1 - V_2)\,dt = i(t)$$

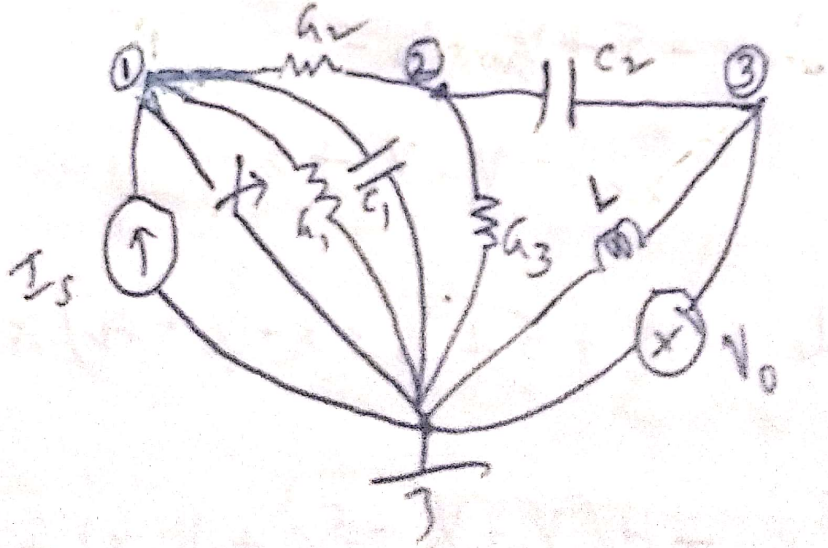
$$V_2 G_2 + \frac{1}{L}\int (V_2 - V_1)\,dt + C\frac{dV_2}{dt} = 0$$

0.01

For the network shown in figure, draw its dual network. (6 marks)

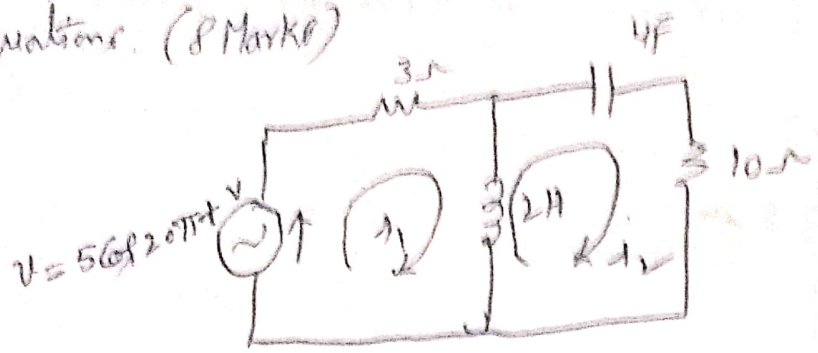


Dual n/w :



b. Draw the exact dual of the network shown in figure by writing Kirchhoff's equations. (8 Marks)

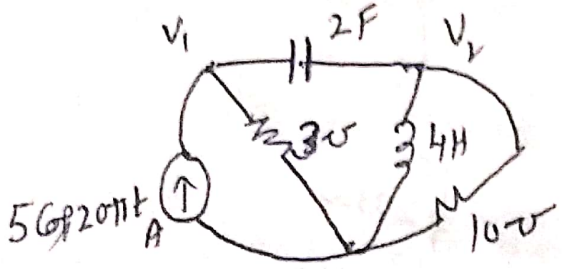
Sol:



KVL: $3i_1 + 2\cdot\frac{d}{dt}(i_1 - i_2) = 5\cos 20\pi t$

$2\cdot\frac{d}{dt}(i_2 - i_1) + \frac{1}{4}\int i_2\,dt + 10 i_2 = 0$

Dual n/w



Numerical value is same. only change the unit.

KCL: (Replace current by voltage)

$3V_1 + 2\cdot\frac{d}{dt}(V_1 - V_2) = 5\cos 20\pi t$

$2\frac{d}{dt}(V_2 - V_1) + \frac{1}{4}\int V_2\,dt + 10V_2 = 0$