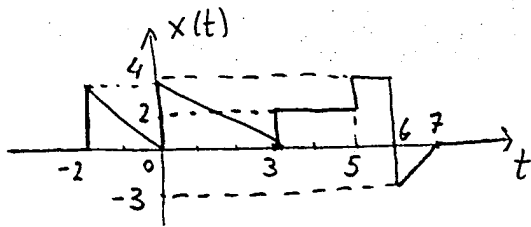


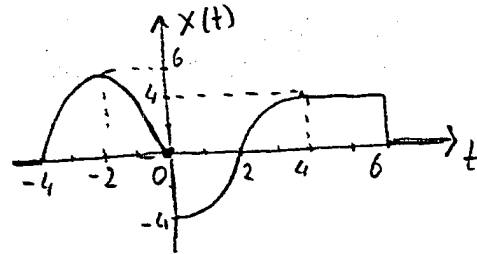
METU / EED

EE 201 / ZPS V

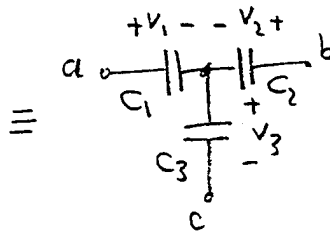
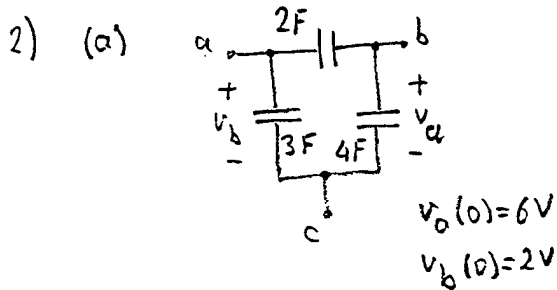
- 1) Plot $\dot{x}(t)$ and $\ddot{x}(t)$. Express $x(t)$, $\dot{x}(t)$ and $\ddot{x}(t)$ in terms of elementary functions.



(a)

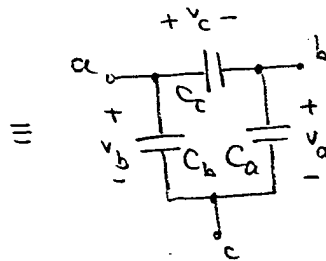
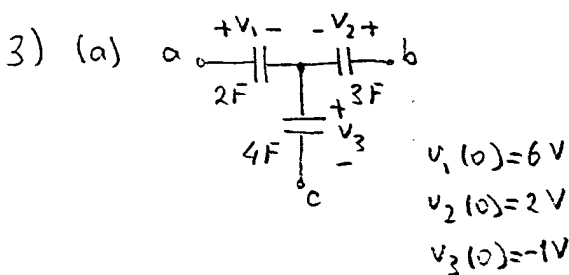


(b)



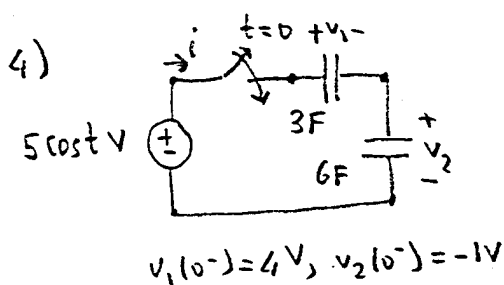
Determine C_1, C_2, C_3 and $v_1(0), v_2(0), v_3(0)$.

- (b) State and solve the dual problem.



Determine C_a, C_b, C_c and $v_a(0), v_b(0), v_c(0)$.

- (b) State and solve the dual problem.

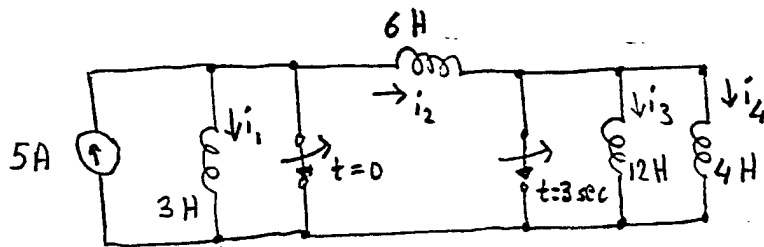


Find $i(t), v_1(t), v_2(t)$.

Compute the stored energies in the capacitors at $t=0^-$, $t=0^+$ and $t=\pi$ sec.

Compute the energy supplied by the battery on $[0, \pi]$ sec. Verify that the energy is conserved.

5)



$$i_1(0^-) = 2 \text{ A}, i_2(0^-) = -3 \text{ A}$$

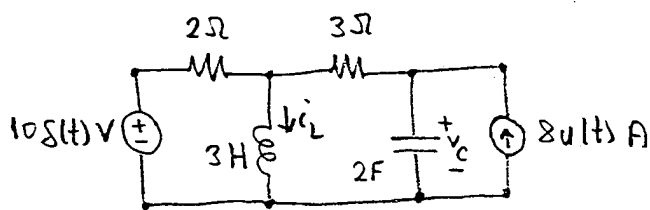
$$i_3(0^-) = 3 \text{ A}, i_4(0^-) = 4 \text{ A}$$

Compute the stored energies in the inductors at $t=0^-$, $t=0^+$, $t=3^-$ sec and $t=3^+$ sec.

Compute the energy supplied by the constant current source on $[0^-, 3^+$ sec].

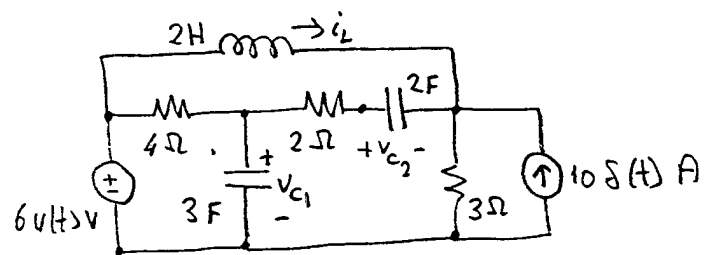
Verify that the energy is conserved.

6) Find the branch voltages and currents at $t=0^-$, $t=0^+$ and $t=\infty$.



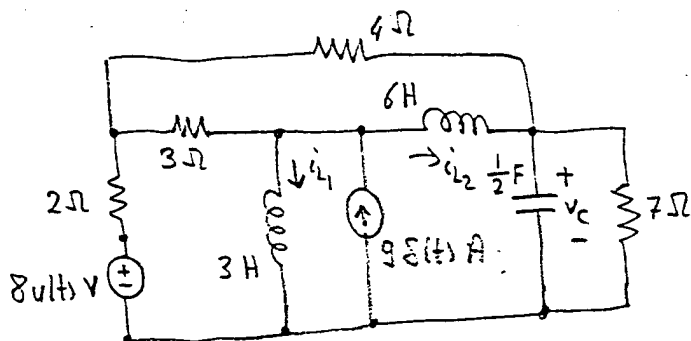
$$v_C(0^-) = -4 \text{ V}, i_L(0^-) = 4 \text{ A}$$

(a)



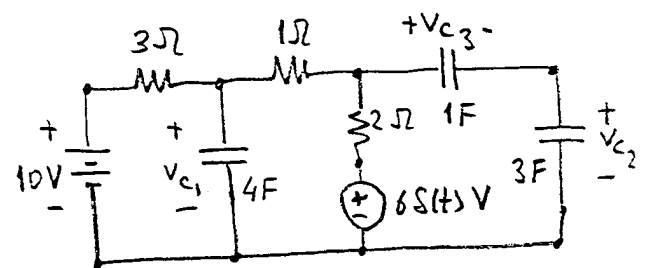
$$i_L(0^-) = 5 \text{ A}, v_{C1}(0^-) = 10 \text{ V}, v_{C2}(0^-) = -5 \text{ V}$$

(b)



$$v_C(0^-) = 6 \text{ V}, i_{L1}(0^-) = 3 \text{ A}, i_{L2}(0^-) = 6 \text{ A}$$

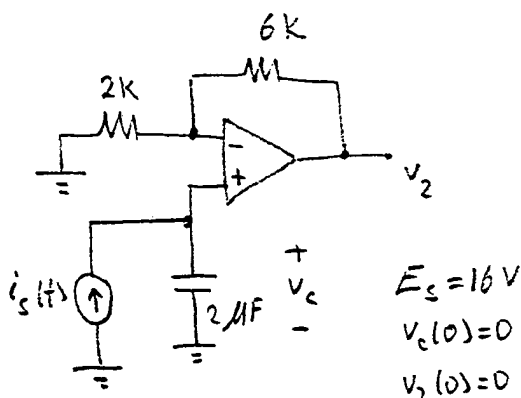
(c)



$$v_{C1}(0^-) = -2 \text{ V}, v_{C2}(0^-) = 4 \text{ V}, v_{C3}(0^-) = 3 \text{ V}$$

(d)

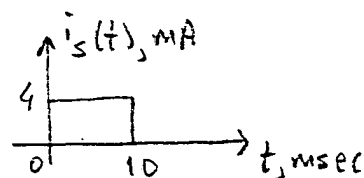
7)



$$E_S = 16 \text{ V}$$

$$v_C(0) = 0$$

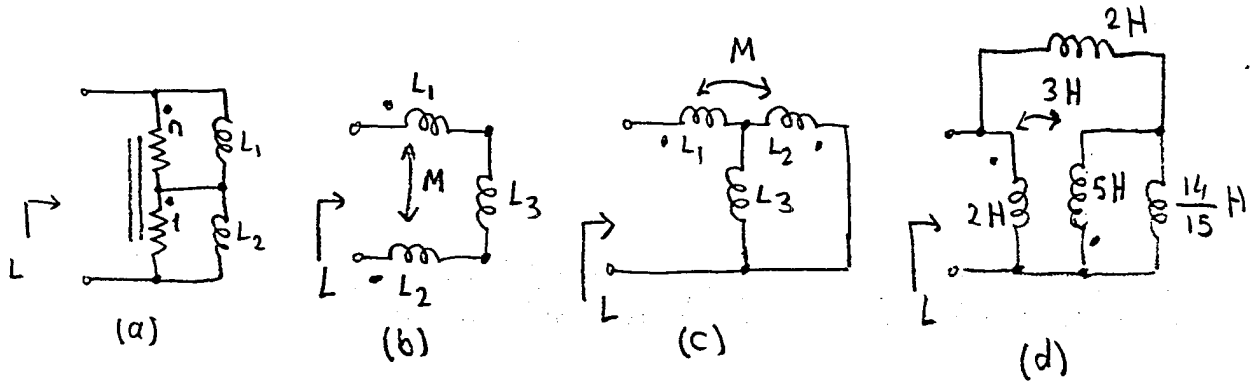
$$v_2(0) = 0$$



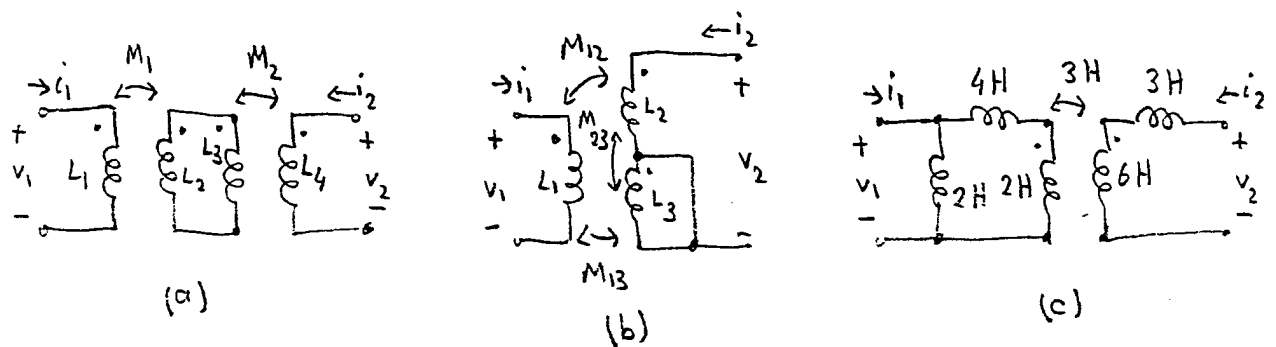
Find and sketch $v_2(t)$ for $t \geq 0$.

8) Find the input inductance.

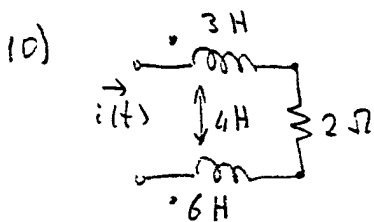
Assume zero initial conditions.



9)
$$\begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} ? \\ ? \end{bmatrix} \frac{d}{dt} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix}$$

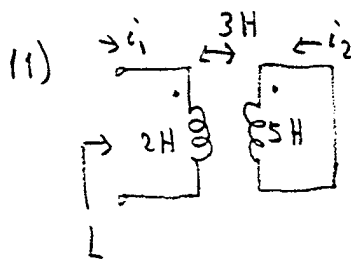


(d) For the circuit of (c): Let $v_2(t) = 0$, $i_1(t) = 7 \cos(5t) \text{ A}$, $i_2(t) = I_m \cos(\omega t) \text{ A}$. Compute the stored energy in the two port at $t = 0$.



$i(t) = 2t^2 u(t) \text{ A}$

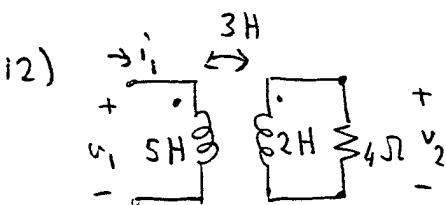
Compute the energy supplied to the one-port on $[0, 2 \text{ sec}]$.



(a) Find L .

(b) For $i_1(t) = 2t \text{ A}$, $i_2(0) = 0$ find $i_2(t)$ for $t > 0$.

Compute the stored energy in the coupled inductor at $t = 5 \text{ sec}$.



$v_2(t) = 12 \cos t \text{ V}$, $i_1(0) = 2 \text{ A}$

Find $v_1(t)$. Compute the stored energy in the coupled inductor at $t = 0$.