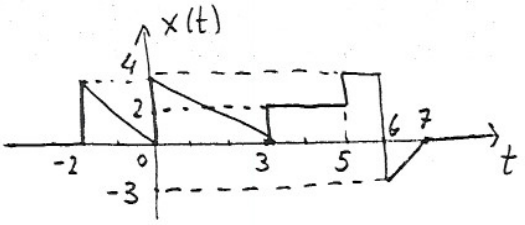
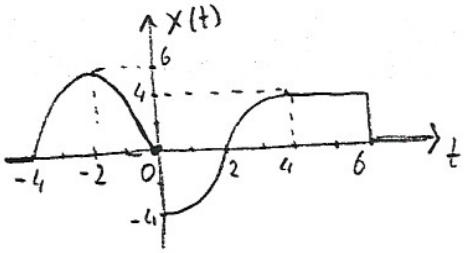
METU /EEED

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.

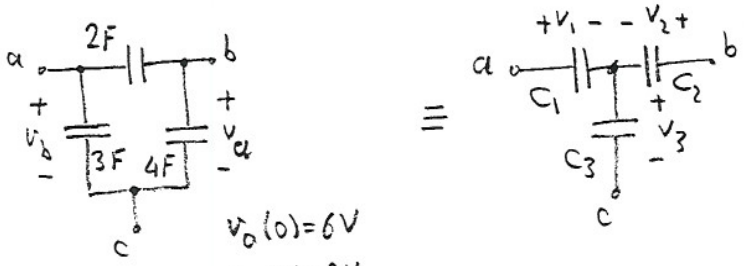


(a)



(b)

2) (a)



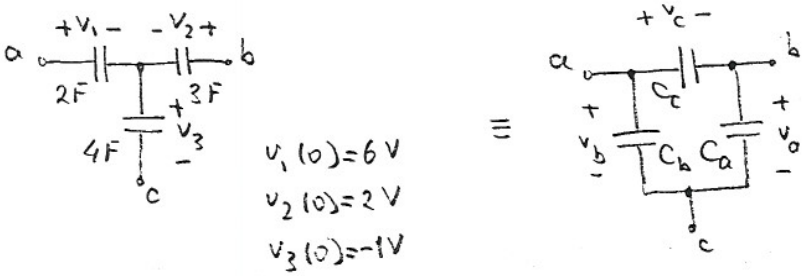
$v_a(0) = 6V$

$v_b(0) = 2V$

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

(b) State and solve the dual problem.

3) (a)



$v_1(0) = 6V$

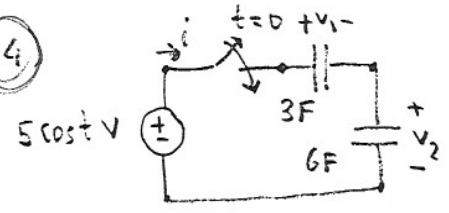
$v_2(0) = 2V$

$v_3(0) = -1V$

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

(b) State and solve the dual problem.

4)



$v_1(0^-) = 4V$, $v_2(0^-) = -1V$

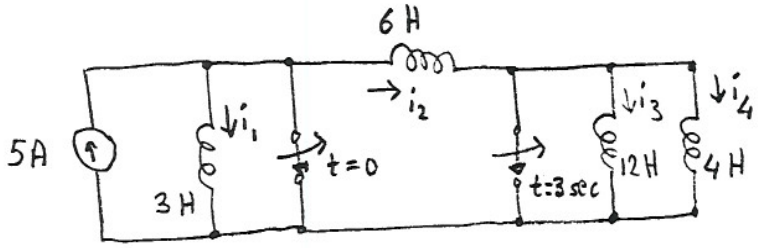
Find $i(t)$, $v_1(t)$, $v_2(t)$.

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

Compute the energy supplied by the battery on $[0^-, \pi \text{ sec}]$

Verify that the energy is conserved.

5)



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

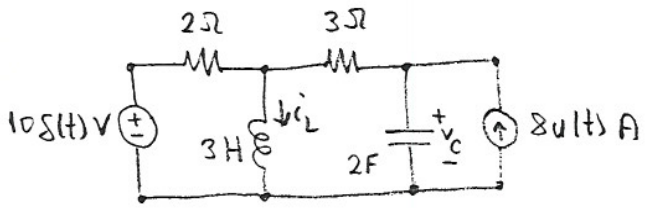
$i_3(0^-) = 3\ A,\ i_4(0^-) = 4\ A$

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 $[0^-, 3^+\ \text{sec}]$.

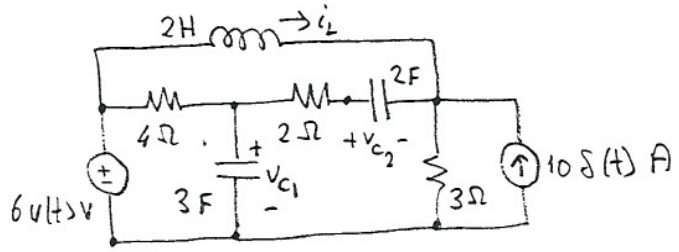
Verify that the energy is conserved.

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



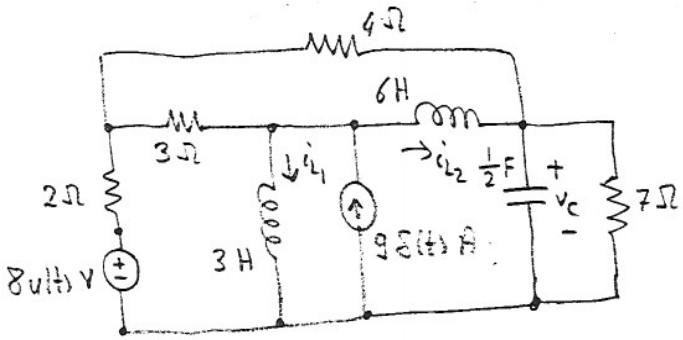
$v_c(0^-) = -4V,\ i_L(0^-) = 4A$

(a)



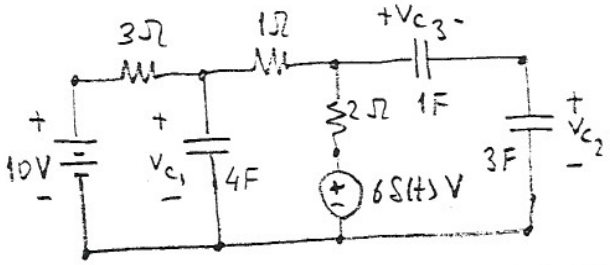
$i_L(0^-) = 5A,\ v_{C_1}(0^-) = 10V,\ v_{C_2}(0^-) = -5V$

(b)



$v_c(0^-) = 6V,\ i_{L_1}(0^-) = 3A,\ i_{L_2}(0^-) = 6A$

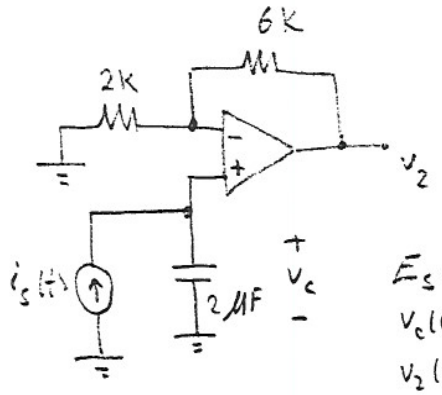
(c)



$v_{C_1}(0^-) = -2V,\ v_{C_2}(0^-) = 4V,\ v_{C_3}(0^-) = 3V$

(d)

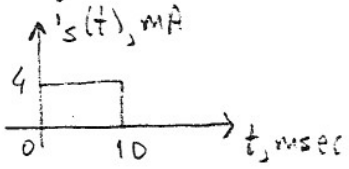
7)



$E_s = 16\ V$

$v_c(0) = 0$

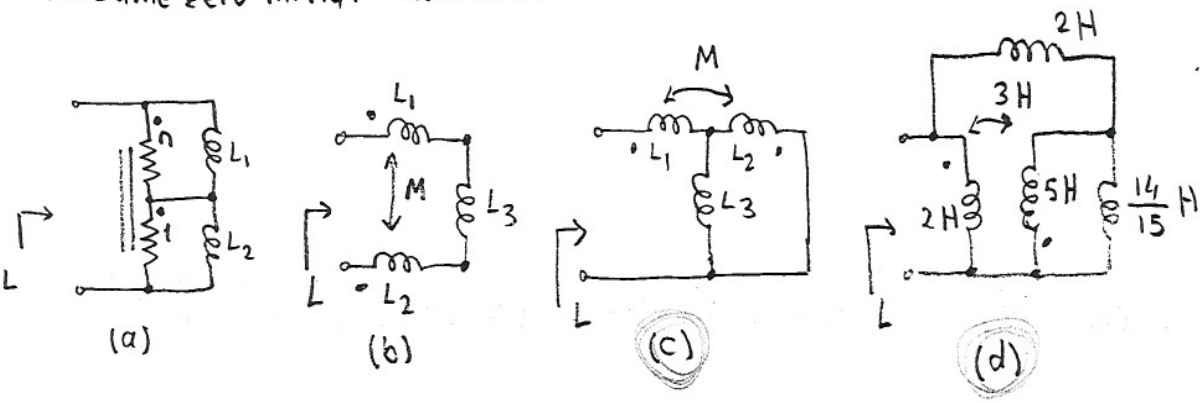
$v_2(0) = 0$



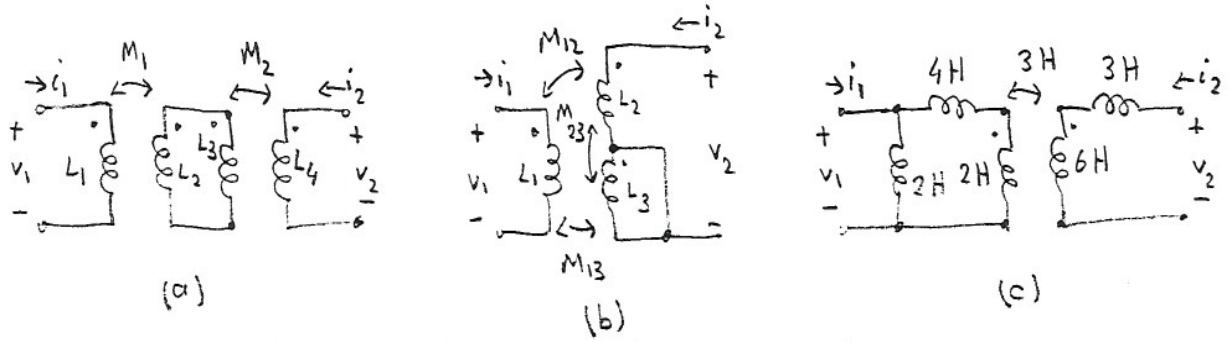
Find and sketch $v_2(t)$ for $t \geq 0$.

8) Find the input inductance.

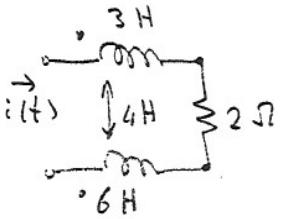
Assume zero initial conditions.



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

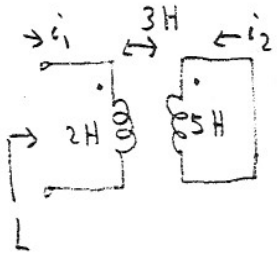


(d) For the circuit of (c): Let $v_2(t)=0$, $i_1(t)=7\cos(5t)$ A, $i_2(t)=I_m\cos(\omega t)$ A.
Compute the stored energy in the two port at $t=0$.

10) 

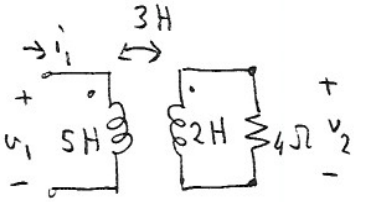
$i(t) = 2t^2 u(t)$ A

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

11) 

(a) Find L.

(b) For $i_1(t) = 2t$ A, $i_2(0) = 0$ find $i_2(t)$ for $t > 0$.
Compute the stored energy in the coupled inductor at $t = 5$ sec.

12) 

$v_2(t) = 12\cos t$ V, $i_1'(0) = 2$ A

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