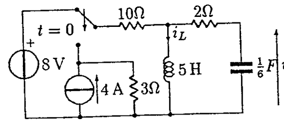
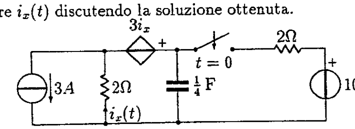
ESERCITAZIONE 5

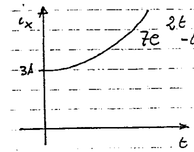
Calcolare i_L v_C $\frac{di_L}{dt}$ e $\frac{dv_C}{dt}$ all' istante $t = 0^+$



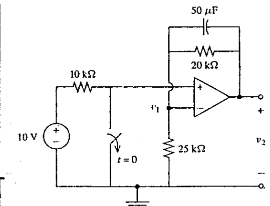
Riposta: $i_L(0^+) = i_L(0^-) = 0.8\,\mathrm{A}$, $v_C(0^+) = v_C(0^-) = 0\,\mathrm{V}$, $\frac{di_L}{dt}|_{t=0^+} = -0.4\,\mathrm{A/s}$, $\frac{dv_C}{dt}|_{t=0^+} = -6\,\mathrm{V/s}$

Calcolare e disegnare $i_x(t)$ discutendo la soluzione ottenuta.



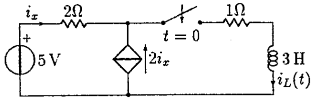


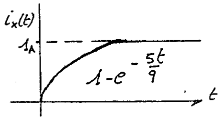
Riposta: $i_x(t) = 7e^{2t} - 4$ Non è un transitorio



$v_2(t) = \begin{cases} 18 - 8e^{-t}, & t \geq 0 \\ 0, & t < 0 \end{cases}$

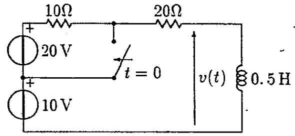
Calcolare e disegnare $i_x(t)$ per $t \geq 0^+$



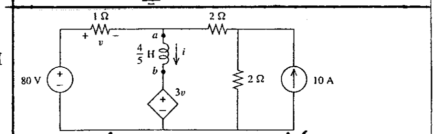


Riposta: $t < 0 : i_L = 0$; $t \geq 0 : i_L = 1 - e^{-\frac{5}{9}t}$

Calcolare $v(t)$ per $t \geq 0^+$

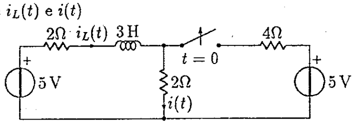


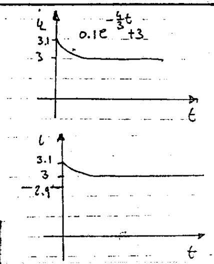
Riposta: $v(t) = -2e^{-40t}$



$i(t) = 10 - 8e^{-4t}$ A

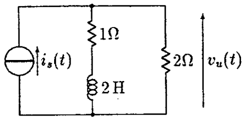
Calcolare e disegnare $i_L(t)$ e $i(t)$

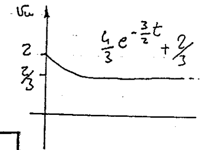




Riposta: $t < 0 : i_L(t) = 3.1\,\mathrm{A}$; $t \geq 0 : i_L(t) = 3 + 0.1e^{-\frac{4}{3}t}$;
$t < 0 : v(t) = 2.9\,\mathrm{V}$; $t \geq 0 : v(t) = 3 + 0.1e^{-\frac{4}{3}t}$

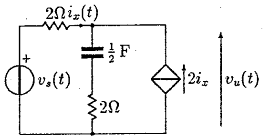
Nella rete in figura determinare $v_u(t)$ sapendo che il generatore di corrente è $i_s(t) = u(t)$ A

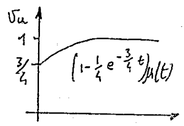




Riposta: $v_u(t) = \frac{4}{3}e^{-\frac{3}{2}t} + \frac{2}{3}$

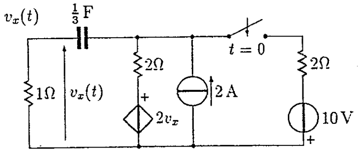
Noto l'ingresso $v_s(t) = u(t)$ V calcolare e disegnare l'uscita $v_u(t)$

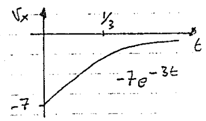




Riposta: $v_u(t) = (1 - \frac{1}{4}e^{-\frac{3}{4}t})u(t)$

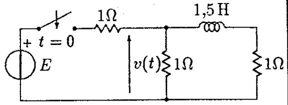
Calcolare e disegnare $v_x(t)$





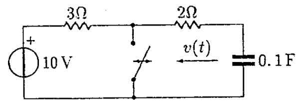
Riposta: $t > 0 : v_x(t) = -7e^{-3t}$

Calcolare $v(t)$.



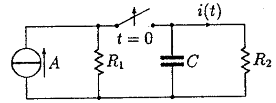
Riposta: $v(t) = \frac{E}{3}(\frac{1}{2}e^{-t} + 1)$

Nel circuito in figura lo switch si apre in $t = 0$ e si chiude in $t = 0.4$, calcolare $v(t)$ per $t \geq 0^+$



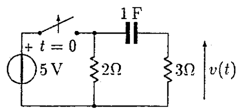
Riposta: per $0 < t < 0.4 : v(t) = 4e^{-2t}$ $t > 0.4 : v(t) = -5.5e^{-5(t-0.4)}$

Calcolare $i(t)$ per $t \geq 0^+$



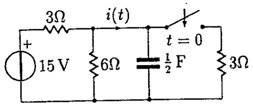
Riposta: $i(t) = A\frac{R_1}{R_1+R_2}e^{-\frac{t}{\tau}}$, $\tau = R_2C$

Calcolare $v(t)$ per $t \geq 0^+$



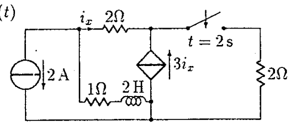
Riposta: $v(t) = -3e^{-\frac{1}{5}t}$

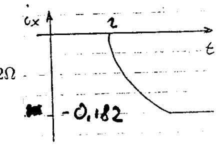
Calcolare $i(t)$



Riposta: $i(t) = 2(1 - e^{-\frac{5}{3}t})$

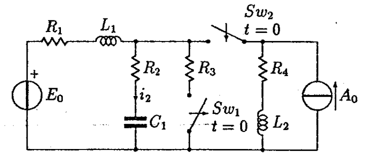
Calcolare e disegnare $i_x(t)$



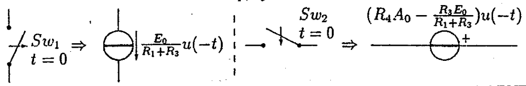


Riposta: $i_x(t) = 0.182e^{-\frac{t-2}{2}} - 0.182$

Nella rete in figura i generatori E_0 e A_0 sono in continua e la rete è operante da $t = -\infty$. Determinare i generatori equivalenti agli interruttori e l'uscita $i(t)$ per $t = 0^+$ e $t = 0^-$ giustificando la discontinuità.

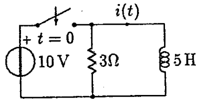


Riposta: $i_2(0^-) = 0$, $i_2(0^+) = \frac{E_0}{R_1+R_3}$



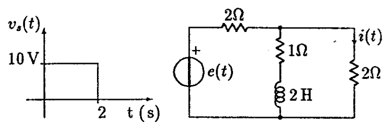
Nell' ipotesi di ingressi in c.c. qual' è la formula che esprime l'uscita di una rete con una costante di tempo τ a partire dall' istante t_0 ?
Riposta: $y(t) = [y(t_{0^+}) - y_\infty]e^{-\frac{t-t_0}{\tau}} + y_\infty$

Determinare $i(0^+)$ e $\frac{di}{dt}|_{t=0^+}$ assumendo che per $t < 0$, l'interrutore è aperto da lungo tempo.



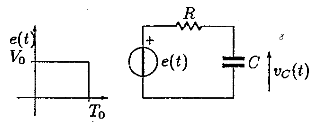
Riposta: $i(0^+) = i(0^-) = 0\,\mathrm{A}$, $\frac{di}{dt}|_{t=0^+} = 2\,\mathrm{A/s}$

Calcolare $i(t)$ noto l'andamento temporale dell' eccitazione alla rete v_s in figura



Riposta: $i(t) = \frac{5}{4}(1 + e^{-t})u(t) - \frac{5}{4}(1 - e^{-(t-2)})u(t-2)$

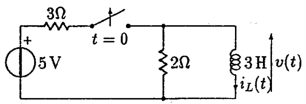
Noto l'eccitazione del generatore $e(t)$ sulla rete, calcolare $v_C(t)$ tracciarne l'andamento al variare di R e commentare la risposta, ed infine si calcoli l'energia immagazinata da C da $t = 0$ a $t = T_0$

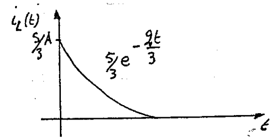


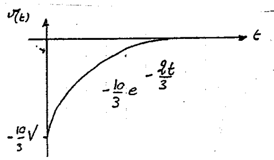
Riposta: $0 \le t \le T_0 : v_C(t) = V_0(1 - e^{-\frac{t}{\tau}})$, $T_0 \le t < \infty : v_C(t) = V_0(1 - e^{-\frac{t}{\tau}})e^{-\frac{t-T_0}{\tau}}$, $\tau = RC$;
$\Delta W = \frac{1}{2}CV_0^2(1 - e^{-\frac{T_0}{\tau}})^2$

Un alimentatore con tensione V_0 e resistenza R carica un condensatore C, quanto vale l'energia erogata dall'alimentatore?
Riposta: $W = CV_0^2$

Calcolare e disegnare $v(t)$ e $i_L(t)$ per $t \ge 0^+$

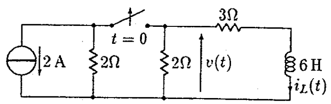


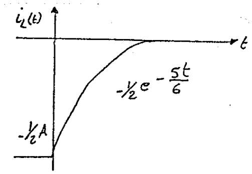


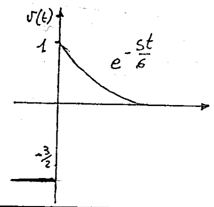


Riposta: $t \ge 0 : i_L = \frac{5}{3}e^{-\frac{2}{3}t}$; $t < 0 : v(t) = 0$;
$t \ge 0 : v(t) = -2i_L = -\frac{10}{3}e^{-\frac{2}{3}t}$

Calcolare e disegnare $v(t)$ e i_L per $t \ge 0^+$

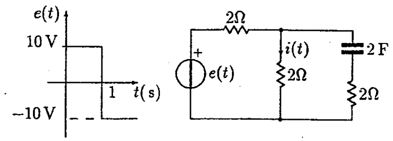






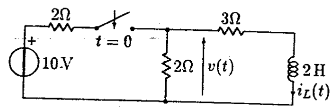
Riposta: $t < 0 : i_L = -\frac{1}{2}\,\mathrm{A}$; $t \ge 0 : i_L = -\frac{1}{2}e^{-\frac{5}{6}t}$;
$t < 0 : v(t) = -\frac{3}{2}$; $t \ge 0 : v(t) = e^{-\frac{5}{6}t}$

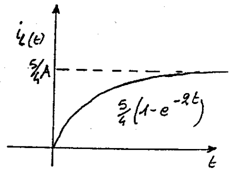
Noto l'adamento temporale di $e(t)$ fornire un espressione analitica per l'uscita $i(t)$.

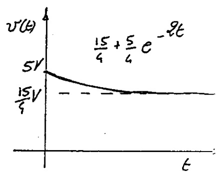


Riposta: $i(t) = (\frac{5}{2} - \frac{5}{6}e^{-\frac{1}{6}t})u(t) + (-\frac{10}{3}e^{\frac{1-t}{6}} - 5(1 - e^{\frac{1-t}{6}}))u(t-1)$

Calcolare e disegnare $v(t)$ e i_L per $t \ge 0^+$







Riposta: $t < 0 : i_L = 0$; $t \ge 0 : i_L = \frac{5}{4}(1 - e^{-2t})$;
$t < 0 : v(t) = 0$; $t \ge 0 : v(t) = \frac{15}{4} + \frac{5}{4}e^{-2t}$