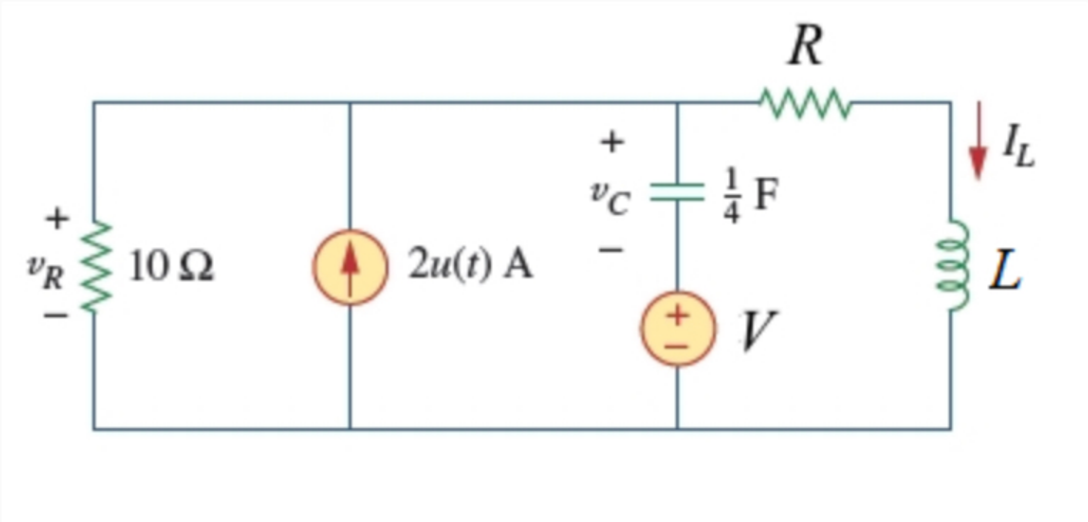
1.

value:
10.00 points

In the circuit given below, $R = 30\ \Omega$, $V = 30$ V, and $L = 1/6$ H.



Calculate $i_L(0^+)$, $v_C(0^+)$, and $v_R(0^+)$.

The value of $i_L(0^+)$ is ______ A.

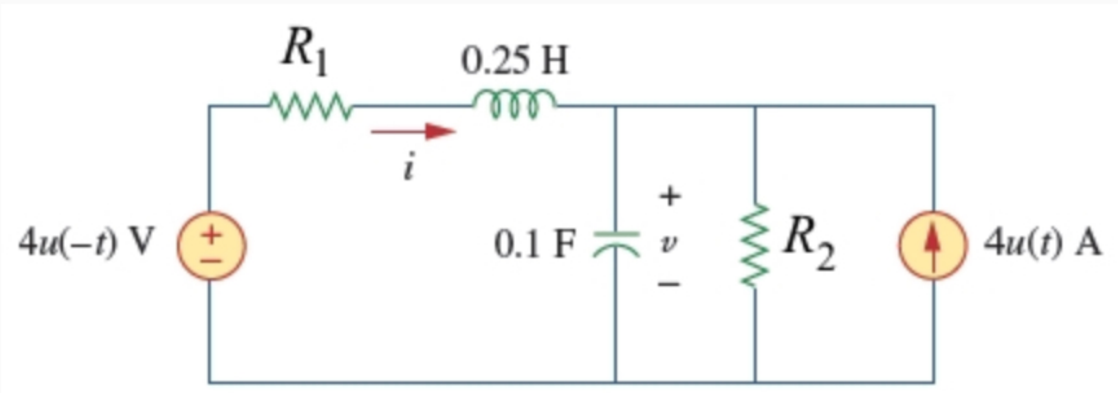
The value of $v_C(0^+)$ is ______ V.

The value of $v_R(0^+)$ is ______ V.

2.

value:
10.00 points

In the circuit given below, $R_1 = 4\ \Omega$ and $R_2 = 7\ \Omega$.



Find $dv(0^+)/dt$ and $di(0^+)/dt$.

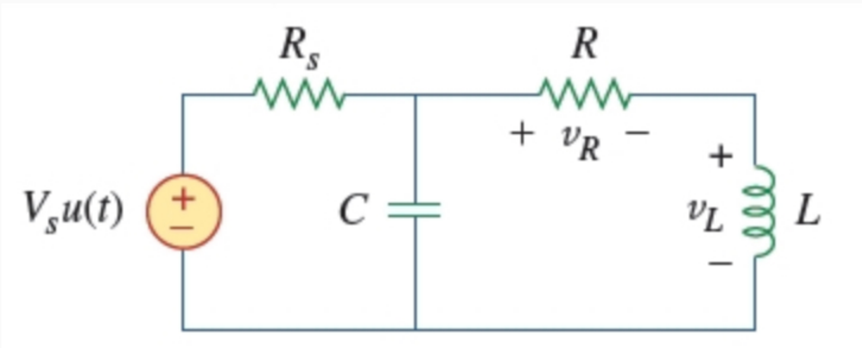
The value of $dv(0^+)/dt$ is ______ V/s.

The value of $di(0^+)/dt$ is ______ A/s.

3.

value:
10.00 points

Consider the circuit given below.



Determine $v_R(0^+)$ and $v_L(0^+)$.

The value of $v_R(0^+)$ is ______ V.

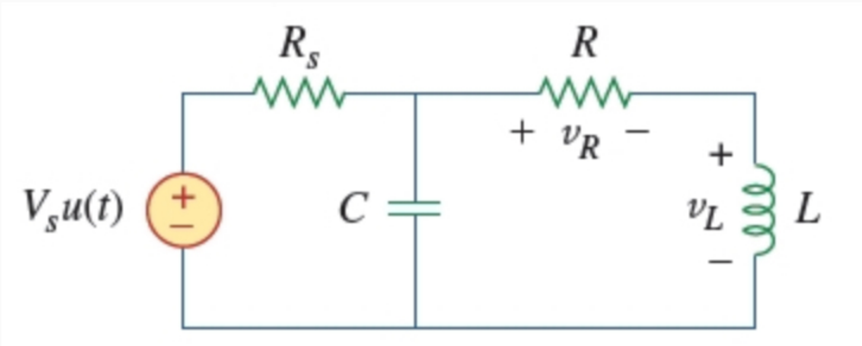
The value of $v_L(0^+)$ is ______ V.

4.

value:

10.00 points

Consider the circuit given below.



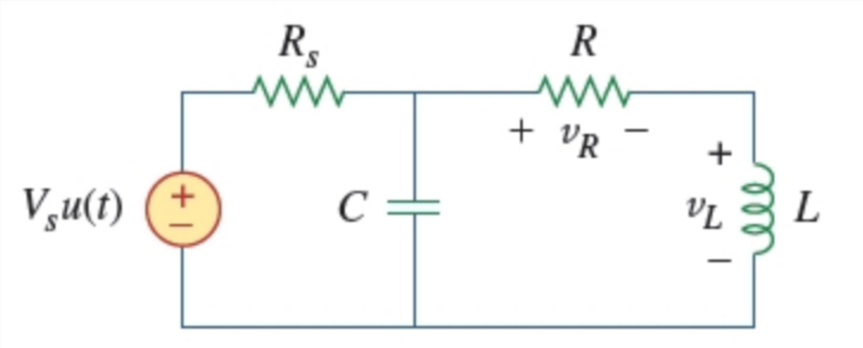
Find $dv_R(0^+)/dt$ and $dv_L(0^+)/dt$.

- $\frac{dv_R(0^+)}{dt} = 0 \text{ V/s}; \frac{dv_L(0^+)}{dt} = \frac{V_s}{R_s}$
- $\frac{dv_R(0^+)}{dt} = \frac{V_s}{R_s}; \frac{dv_L(0^+)}{dt} = \frac{V_s}{CR_s}$
- $\frac{dv_R(0^+)}{dt} = 0 \text{ V/s}; \frac{dv_L(0^+)}{dt} = \frac{V_s}{CR_s}$
- $\frac{dv_R(0^+)}{dt} = \frac{V_s}{CR_s}; \frac{dv_L(0^+)}{dt} = 0 \text{ V/s}$

5.

value:
10.00 points

Consider the circuit given below.



Find $v_R(\infty)$ and $v_L(\infty)$.

- $v_R(\infty) = 0$ V; $v_L(\infty) = \left(\frac{R}{R+R_s}\right)V_s$
- $v_R(\infty) = \left(\frac{R}{R_s}\right)V_s$; $v_L(\infty) = 0$ V
- $v_R(\infty) = \left(\frac{R}{R+R_s}\right)V_s$; $v_L(\infty) = 0$ V
- $v_R(\infty) = 0$ V; $v_L(\infty) = \left(\frac{R_s}{R}\right)V_s$

6.

value:
10.00 points

The current in an *RLC* circuit is described by

$$\frac{d^2 i}{dt^2} + 10\frac{di}{dt} + 25\,i = 0$$

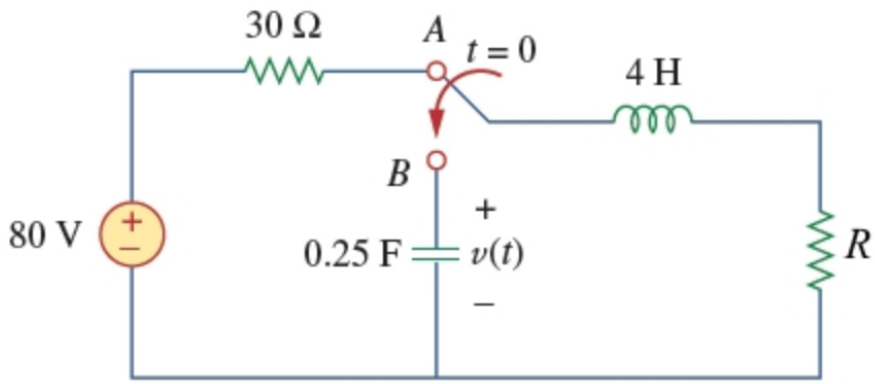
If $i(0) = 10$ A and $di(0)/dt = 0$, then for $t > 0$, $i(t) = (\mathbf{A} + \mathbf{B}t)e^{\mathbf{s}t}$ A,

where **A** = ______, **B** = ______, and **s** = ______.

7.

value:
10.00 points

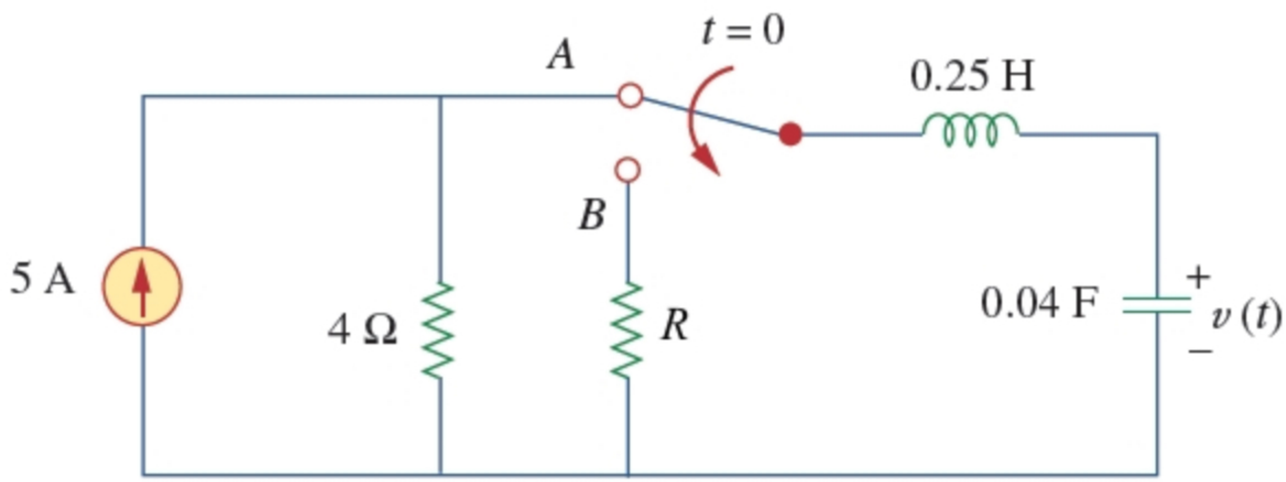
In the circuit given below, $R = 10\ \Omega$. The switch in the circuit moves from position A to position B at $t = 0$ (please note that the switch must connect to point B before it breaks the connection at A, a make-before-break switch). Let $v(0) = 0$. Find $v(t)$ for $t > 0$.



- $v(t) = -(5.333)e^{-(-0.50)t} + (-5.333)e^{-(-2.00)t}$ V
- $v(t) = (5.333)e^{-0.50t} + (-5.333)e^{-2.00t}$ V
- $v(t) = -(5.333)e^{-(-0.50)t} - (-5.333)e^{-(-2.00)t}$ V
- $v(t) = (5.333)e^{-0.50t} - (-5.333)e^{-(-2.00)t}$ V

8. value: 10.00 points

In the circuit given below, R = 20 Ω and the switch moves (a make-before-break switch) from position A to B at t = 0. Find $v(t)$ for all $t \geq 0$.



The voltage equation is $v(t)$ = $\mathbf{A}e^{\mathbf{s1}t} + \mathbf{B}e^{\mathbf{s2}t}$,

where **A** = ______, **B** = ______, **s1** = ______ and **s2** = ______.

9.

value:
10.00 points

Assuming $R = 12\ \text{k}\Omega$, design a parallel RLC circuit that has the characteristic equation $s^2 + 100s + 10^6 = 0$.

The value of L is ______ H.

The value of C is ______ nF.

10.

value:
10.00 points

A branch voltage in an *RLC* circuit is described by

$$\frac{d^2v}{dt^2} + 4\frac{dv}{dt} + 8v = 24$$

If the initial conditions are $v(0) = 8 = dv(0)/dt$, find $v(t)$.

- ○ $v(t) = (3 + (5\cos(2t) + 9.0\sin(2t))e^{-2t})$ volts
- ○ $v(t) = (3 + (\cos(2t) + \sin(2t))e^{-2t})$ volts
- ○ $v(t) = ((5\cos(2t) + \sin(2t))e^{-2t})$ volts
- ○ $v(t) = (3 + (5\cos(2t) - 9.0\sin(2t))e^{-2t})$ volts

11.

value:
10.00 points

A series *RLC* circuit is described by

$$L\frac{d^2i}{dt^2} + R\frac{di}{dt} + \frac{i}{C} = 10$$

Find the response when L = 0.5 H, R = 4 Ω, and C = 0.2 F. Let $i(0)$ = 1, $di(0)/dt$ = 0.

The current equation is $i(t)$ = **E** + [**A**$e^{\mathbf{s1}}$ + **B**$e^{\mathbf{s2}}$] A,

where **A** = ______, **B** = ______, **s1** = ______, **s2** = ______, and **E** = ______.

12.

value:
10.00 points

Solve the following differential equation subject to the specified initial conditions.

$$\frac{d^2i}{dt^2} + 5\frac{di}{dt} + 4i = 8$$

Given that the initial conditions are $i(0) = -2$ and $di(0)/dt = 2$.

The current equation is $i(t) = (\mathbf{E} - \mathbf{A}e^{\mathbf{s1}t} + \mathbf{B}e^{\mathbf{s2}t})$ A,

where **A** = ____, **B** = ____, **s1** = ____, **s2** = ____, and **E** = ____.

13.

value:
10.00 points

Solve the following differential equation subject to the specified initial conditions.

$$\frac{d^2v}{dt^2} + 2\frac{dv}{dt} + v = 3$$

Given that the initial conditions are $v(0) = 4$ and $dv(0)/dt = 1$.

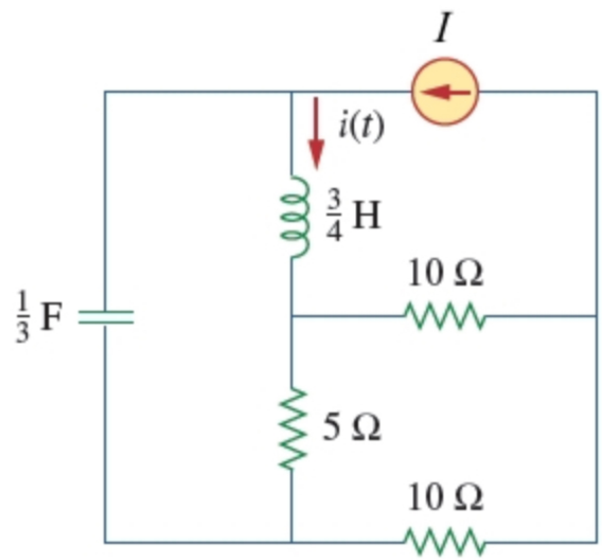
The voltage equation is $v(t) = [\mathbf{D} + (\mathbf{A} + \mathbf{B}t)e^{\mathbf{s3}t}]$ V,

where **A** = ______, **B** = ______, **s3** = ______, and **D** = ______.

14.

value:
10.00 points

In the circuit given below, $I = 15[1 - u(t)]$ A. Calculate $i(t)$ for $t > 0$.



The current equation is $i(t) = [\mathbf{A}e^{\mathbf{s1}t} + \mathbf{B}e^{\mathbf{s2}t}]$ A,

where **A** = ______, **B** = ______, **s1** = ______, and **s2** = ______.

15.

value:
10.00 points

The step response of a parallel *RLC* circuit is

$$v = 10 + 20e^{-300t}(\cos(400t) - 2\sin(400t))\ \text{V},\ t \geq 0$$

when the inductor is 10 mH. Find *R* and *C*.

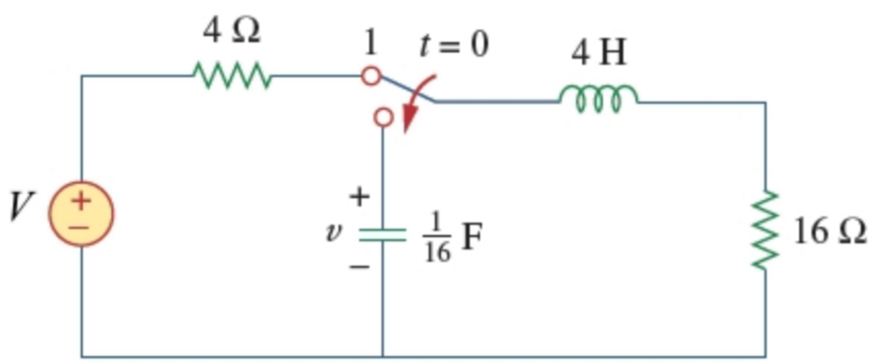
The value of *C* is ______ μF.

The value of *R* is ______ Ω.

16.

value:
10.00 points

In the circuit given below, $V = 50$ V. The switch in the circuit has been positioned at 1 for $t < 0$. At $t = 0$, it is moved from position 1 to the top of the capacitor. Please note that the switch is a make-before-break switch, and it stays in contact with position 1 until it makes contact with the top of the capacitor and then breaks the contact at position 1. Given that the initial voltage across the capacitor is equal to zero, determine $v(t)$.



The voltage equation is $v(t)$ = **D** + [**A** + **B**t]$e^{-\mathbf{s}t}$ V,

where **A** = ____, **B** = ____, **s** = ____, and **D** = ____.