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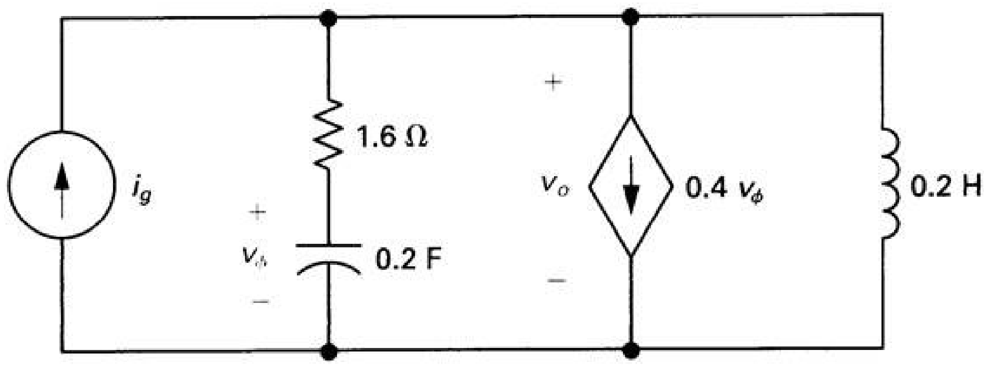
|---|---|
| **Started on** | Monday, 3 April 2017, 2:08 AM |
| **State** | Finished |
| **Completed on** | Monday, 3 April 2017, 5:15 AM |
| **Time taken** | 3 hours 6 mins |
| **Grade** | **77.14** out of 100.00 |

**Question 1**

Partially correct

Mark 5.00 out of 10.00




P13.11_6ed

There is no energy stored in the circuit at t = 0.

Find $v_0(t)$ if $i_g(t)$ = 15 u(t) A.

$v_0(t)$ = [ 120 ✗ t exp( -5 ✓ t) + -225 ✗ exp( -5 ✓ t)] u(t) V

$$v_0(t) = [-45te^{-5t} + 24e^{-5t}]u(t)V$$

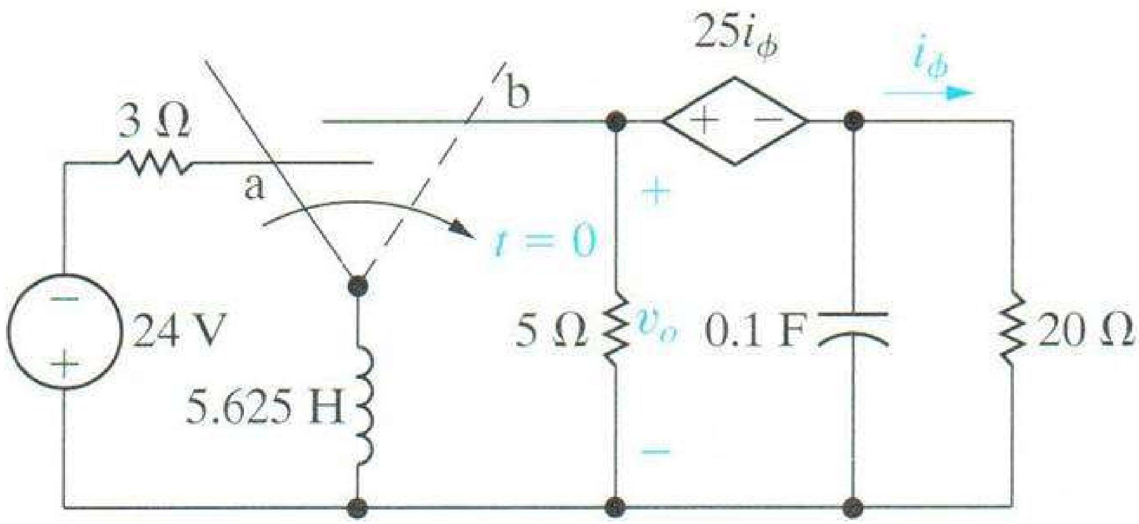
**Partially correct**

Marks for this submission: 5.00/10.00.

**Question 2**

Correct

Mark 10.00 out of 10.00




P13.14_7ed

The switch in this circuit is a “make then break” type of switch which allows for continuous current flow. At time t = 0, the switch moves from position “a” to position “b”.

a) For t > 0, Redraw this circuit in the frequency domain and find the Laplace form of the voltage $v_0(t)$.

V(s) = 180 / ($s^2$ + 5 s + 4 )

b) Find the inverse transform to find the time domain $v_0(t)$.

$v_0(t)$ = [ 60 exp( -1 t) + -60 exp( -4 t)] u(t) V

$$V_0(s) = \frac{180}{s^2+5s+4}$$

$$v_0(t) = [60e^{-t} - 60e^{-4t}]u(t)V$$

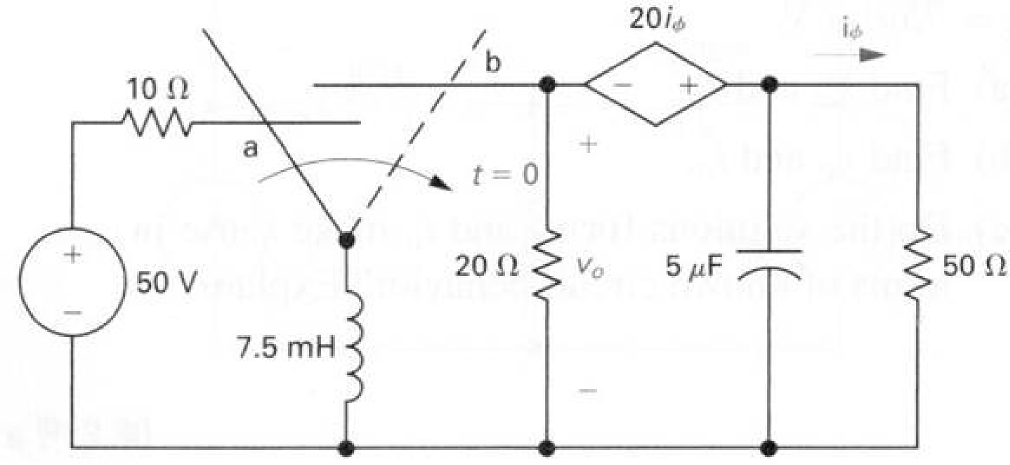
**Correct**

Marks for this submission: 10.00/10.00.

**Question 3**

Incorrect

Mark 0.00 out of 10.00




P13.23_6ed

The switch has been in position a for a long time. At t = 0, the switch moves instantaneously to position b.

a) For t > 0, Redraw this circuit in the frequency domain and find the Laplace form of the voltage $v_0(t)$.

$V_0(s)$ = [-600] ✗ / [(s + [4*10^6] ✗ ) (s + [1600] ✗ )]

Smaller root first then larger root in the answer above.

b) Find the time domain $v_0(t)$.

$v_0(t)$ = [ [67.56] ✗ exp( [-1500] ✗ t) + [1] ✗ exp( [-200] ✗ t)] u(t) V

$$V_0 = \frac{-600{,}000}{s^2+10{,}000s+16\times10^6} = \frac{-600{,}000}{(s+2{,}000)(s+8{,}000)}$$

$$v_0(t) = \left[-100e^{-2{,}000t} + 100e^{-8{,}000t}\right]u(t)Volts$$

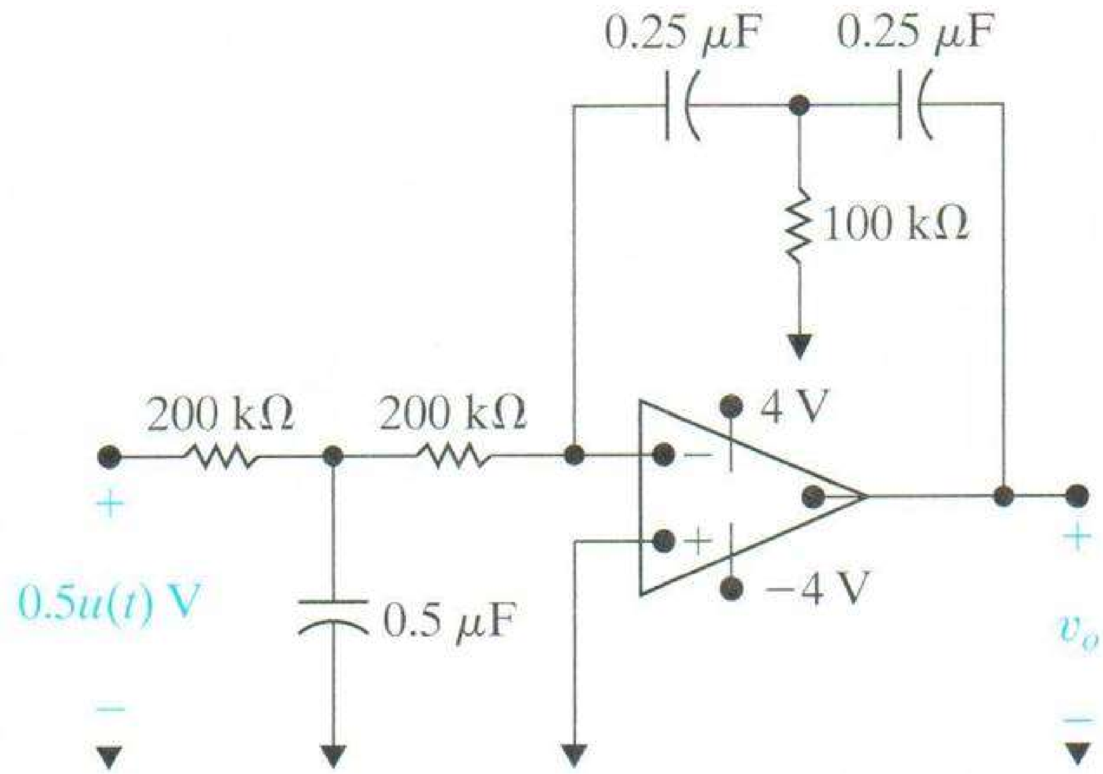
**Incorrect**

Marks for this submission: 0.00/10.00.

Question 4

Correct

Mark 10.00 out of 10.00




P13.48_7ed

Given: No energy is stored in this circuit for t < 0 and you can assume the OpAmp is ideal.

a) For t > 0, Redraw this circuit in the frequency domain and find the Laplace form of the voltage $v_0(t)$.

$V_0(s) =$ -200 / $s^3$

b) Find the inverse transform to find the time domain $v_0(t)$.

$v_0(t) =$ -100 t^ 2 u(t) V

c) Calculate how long in ms (milli sec) until the opamp saturates.

$t_{saturation}$ = 200 ms (milli sec)

$$V_0 = \frac{-200}{s^3}$$

$$v_0(t) = [?][?] - 100t^2 u(t) Volts$$

c) $t_{saturation}$ = 200 ms (milli sec)

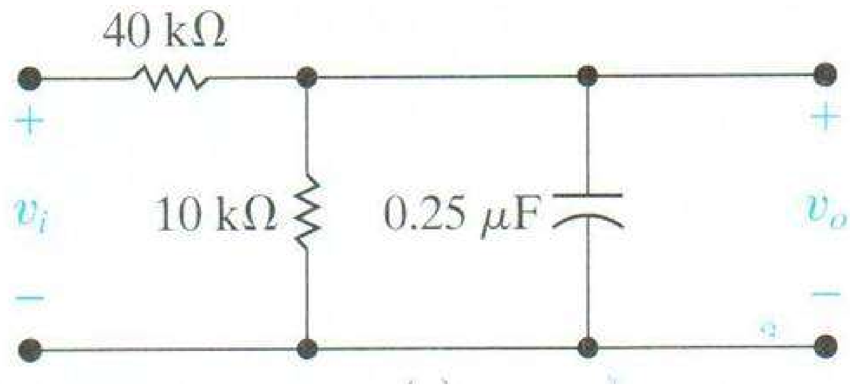
**Correct**

Marks for this submission: 10.00/10.00.

**Question 5**

Correct

Mark 10.00 out of 10.00




P13.49e_7ed

Find the s domain transfer function H(s) = $V_0/V_i$ for this circuit.

H(s) = 100 / (s + 500 )

$$H(s) = \frac{100}{s+500}$$

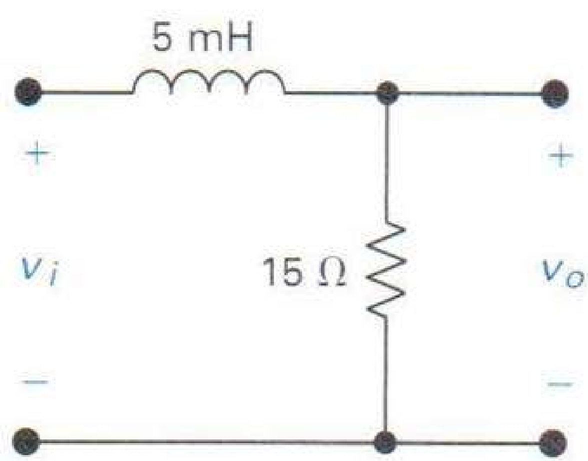
**Correct**

Marks for this submission: 10.00/10.00.

**Question 6**

Partially correct

Mark 5.00 out of 10.00




P13.49d_6ed

Find the s domain transfer function H(s) = $V_0/V_i$ for this circuit.

H(s) = 2 / (s + 3000 )

$$H(s) = \frac{3{,}000}{s+3{,}000}$$

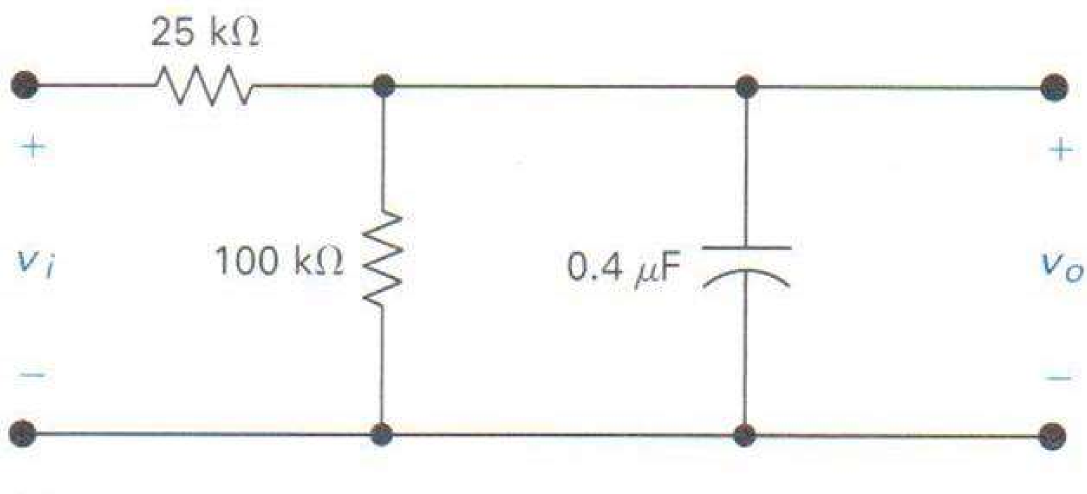
**Partially correct**

Marks for this submission: 5.00/10.00.

**Question 7**

Correct

Mark 10.00 out of 10.00




P13.49e_6ed

Find the s domain transfer function H(s) = $V_0/V_i$ for this circuit.

H(s) = 100 / (s + 125 )

$$H(s) = \frac{100}{s+125}$$

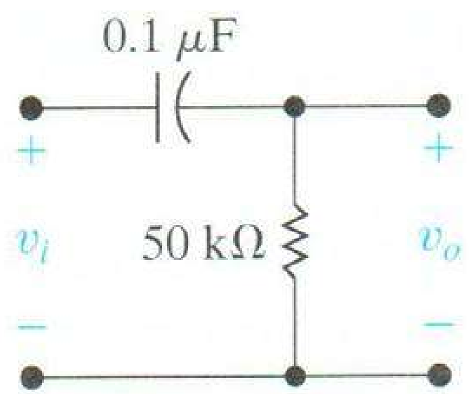
**Correct**

Marks for this submission: 10.00/10.00.

**Question 8**

Correct

Mark 10.00 out of 10.00




P13.49b_7ed

Find the s domain transfer function H(s) = $V_0/V_i$ for this circuit.

H(s) = s / (s + 200 )

$$H(s) = \frac{s}{s+200}$$

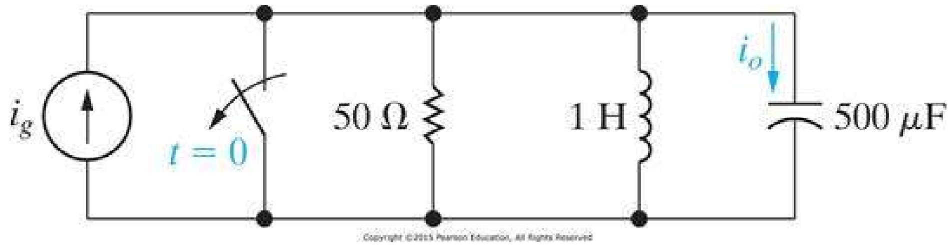
**Correct**

Marks for this submission: 10.00/10.00.

**Question 9**

Partially correct

Mark 7.14 out of 10.00




P13.56_10ed

There is no energy stored in this circuit at the time the switch is opened. The sinusoidal current source is generating the signal 25 cos (200 t) mA (milli Amp). The desired response signal is the current $i_0(t)$.

a) Find the s domain transfer function $H(s) = I_0/I_g$ for this circuit.

$H(s) = s^2 / (s^2 +$ [40] ✓ $s +$ [2000] ✓ )

b) Find the s domain form for $I_0(s)$.

$I_0(s) =$ [.025] ✓ $s^3$ / (There are four factors in the denominator – list each one separately)

Factor 1: s + 20 – j [40] ✓

Factor 2: s + 20 + j [40] ✓

Factor 3: s + 0 - j [200] ✓

Factor 4: s + 0 + j [200] ✓

c) Find the time domain form $i_0(t)$.

$i_0(t) =$ [ [7.197*10^-4] ✗ exp( [-40] ✗ t) cos( [40] ✓ t + [-97.94] ✓ °) + [.0129] ✗ cos( [200] ✓ t + [-11.89] ✗ °)] u(t) mA (milli A)

$$H(s) = \frac{I_0}{I_g} = \frac{s^2}{s^2 + 40s + 2{,}000}$$

$$I_0 = \frac{0.025s^3}{(s+20-j40)(s+20+j40)(s+0-j200)(s+0+j200)}$$

$$i_0(t) = \left[1.4395e^{-20t}\cos(40t - 97.94^\circ) + 25.7514\cos(200t + 11.89^\circ)\right]u(t)mA$$

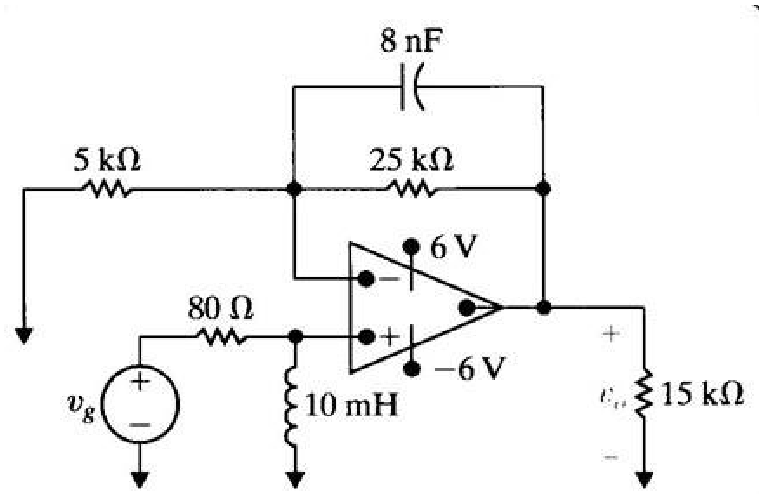
**Partially correct**

Marks for this submission: 7.14/10.00. Accounting for previous tries, this gives **7.14/10.00.**

**Question 10**

Correct

Mark 10.00 out of 10.00




P13.78_7ed and P13.77_10ed

You may assume the opamp is ideal.

a) Find the s domain transfer function $H(s) = V_0/V_g$ for this circuit.

H(s) = s * (s + 30000 ) / [(s + 5,000) * (s + 8000 )]

b) Find the time domain $v_0(t)$ if $v_g(t)$ = 600 u(t) mV (milli V).

$v_0(t)$ = [ 5 $e^{-5,000t}$ + -4.4 exp( -8000 t)] u(t) V

c) Find the steady-state express for $v_0(t)$ if $v_g(t)$ = 2 cos (10,000 t) V.

$v_0(t)_{\text{steady-state}}$ = [ 4.42 cos ( 10000 + -6.34 °] u(t) V

$$H(s) = \frac{s(s+30{,}000)}{(s+5{,}000)(s+8{,}000)}$$

$$v_0(t) = \left[5e^{-5{,}000t} - 4.4e^{-8{,}000t}\right]u(t)\,Volts$$

$$v_0(t)_{steady-state} = 4.4172\cos(10{,}000t - 6.34^{\circ})u(t)\,Volts$$

**Correct**

Marks for this submission: 10.00/10.00.