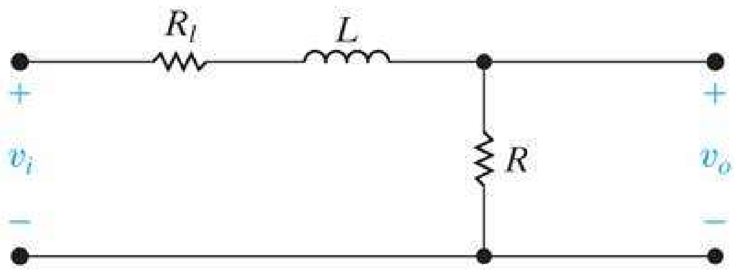
Started on	Sunday, 16 April 2017, 9:15 PM
State	Finished
Completed on	Sunday, 16 April 2017, 9:15 PM
Time taken	8 secs
Grade	**100.00** out of 100.00

Question 1

Correct

Mark 20.00 out of 20.00



P14.3_9ed

A resistor R_l is added in series with the inductor in this circuit.

Given: $R_l = 75\ \Omega$ (Ohm) $L = 10$ mH (mill H) $R = 127\ \Omega$ (Ohm)

a) Find the s domain transfer function $H(s) = V_0/V_i$.

$H(s) =$ 12700 / (s + 20200)

b) At what frequency will the magnitude of H(jw) be maximum?

$w_{H,max} =$ 0 rad/sec

c) What is maximum value of the magnitude of H(jw)?

$H(jw)_{max} =$ .63

d) At what frequency will the magnitude of H(jw) equal its maximum value divided by square root of 2?

$w_{H,max,sqrt(2)} =$ 20200 rad/sec

e) Find w_c (omega$_c$)

$w_c =$ 20200 rad/sec

Now examine the transfer function magnitude and phase as the frequency varies.

f) Find H(jw = 0) in polar form..

H(jw = 0) = Mag .63 at angle 0 ° (Degrees)

g) Find $H(jw = 0.3w_c)$ in polar form.

$H(jw = 0.3w_c)$ = Mag .602 at angle -16.7 ° (Degrees)

h) Find $H(jw = w_c)$ in polar form.

$H(jw = w_c)$ = Mag .44 at angle -45 ° (Degrees)

i) Find $H(jw = 3w_c)$ in polar form.

$H(jw = 3w_c)$ = Mag .2 at angle -71.6 ° (Degrees)

Numeric Answer

a) $\dfrac{V_0}{V_i} = \dfrac{12{,}700}{s+20{,}200}$

b) $\omega_{H,max} = 0$ rad/sec

c) $H(j\omega)_{max} = 0.6287$

d) $\omega_{H,max,sqrt(2)} = 20{,}200$ rad/sec

e) $\omega_c = 20{,}200$ rad/sec

f) $H(j\omega = 0) = 0.6287$

g) $H(j\omega = 0.3\omega_c) = 0.6022 \measuredangle -16.70°$

h) $H(j\omega = \omega_c) = 0.4446 \measuredangle -45°$

i) $H(j\omega = 3\omega_c) = 0.1988 \measuredangle -71.57°$

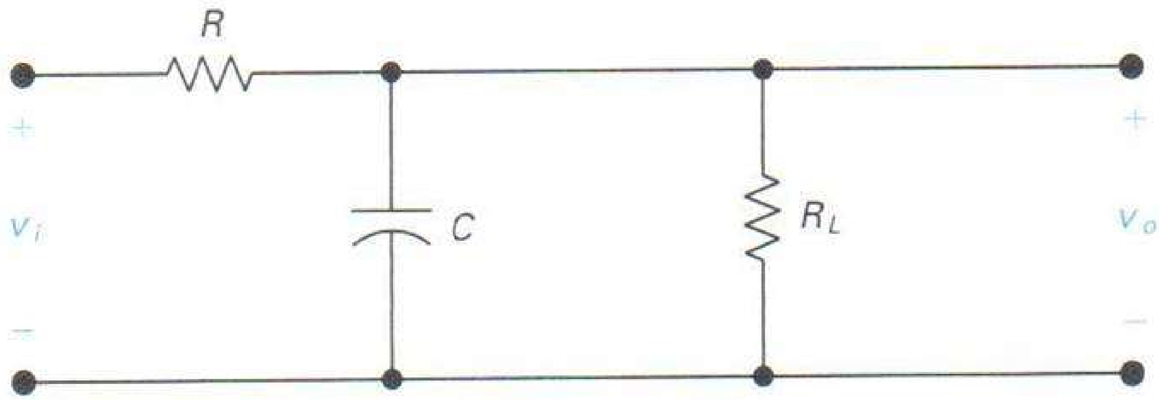
Correct

Marks for this submission: 20.00/20.00.

Question **2**

Correct

Mark 20.00 out of 20.00



P14.3_6ed

A resistor R_L is connected in parallel with the capacitor in this circuit. The circuit thus becomes a loaded low-pass filter.

Given: R = 20 kΩ (kilo Ohm) C = 4 nF R_L = 300 kΩ (kilo Ohm)

a) Find the s domain transfer function $H(s) = V_0/V_i$.

H(s) = 12500 / (s + 13373.33)

b) Find w_c (omega$_c$)

w_c = 13333.3 rad/sec

Now examine the transfer function magnitude and phase as the frequency varies.

c) Find H(j0)

H(j0) = .94

d) Find $H(jw_c)$ i.e. evaluate H(jw) at $w = w_c$

$H(jw_c)$ = Mag .66 Angle -45

e) Find $H(j0.2w_c)$ i.e. evaluate H(jw) at $w = 0.2\,w_c$

$H(j0.2w_c)$ = Mag .92 Angle -11.31

f) Find $H(j8w_c)$ i.e. evaluate H(jw) at $w = 8w_c$

$H(j8w_c)$ = Mag .116 Angle -82.9

Numeric Answer

a) f = 50 Hz

b) ω_c = 13,333.3 rad/sec

c) H(j0) = 0.9375

d) $H(j\omega_c)$ = 0.6629 $\measuredangle$-45°

e) $H(j0.2\omega_c)$ = 0.9193 $\measuredangle$-11.31° This is an exact answer to the passband region.

f) $H(j8\omega_c)$ = 0.1163 $\measuredangle$-82.87° This is an exact answer to the stopband region.

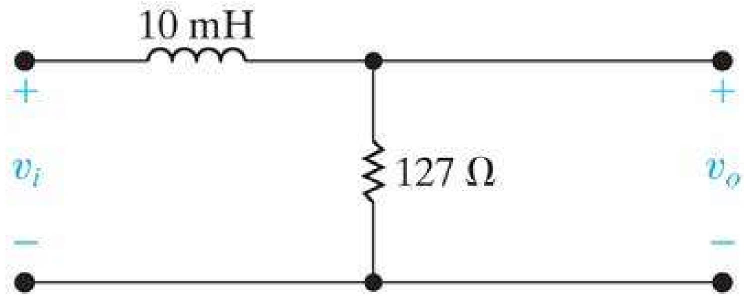
Correct

Marks for this submission: 20.00/20.00.

Question 3

Correct

Mark 20.00 out of 20.00



P14.1_9ed

a) Find the cutoff frequency in hertz.

f_c = 2021.26 Hz

b) Find H(jω = 0) in polar form.

H(jw = 0) = Mag 1 at angle 0 ° (Degrees)

Now examine the output magnitude and phase as the input frequency varies.

c) Find H(jw = 0.2ω_c) in polar form..

H(jw = 0.2ω_c) = Mag .98 at angle -11.31 ° (Degrees)

d) Find H(jω = ω_c) in polar form.

H(jω = ω_c) = Mag .71 at angle -45 ° (Degrees)

e) Find H(jω = 5ω_c) in polar form.

H(jw = 5ω_c) = Mag .196 at angle -78.69 ° (Degrees)

Now given $v_i(t)$ = 10 cos(ω t) V. Write the steady-state expression for v_0 for:

f) ω = 0.2ω_c

$v_0(t)$ = 9.81 cos(2540 t + -11.31 °) Volts

g) ω = ω_c

$v_0(t)$ = 7.07 cos(12700 t + -45 °) Volts

h) ω = 5ω_c

$v_0(t)$ = 1.96 cos(63500 t + -78.69 °) Volts

a) f_c = 2021.27 Hz

b) H(jω = 0) = 1 ∠ 0°

c) H(jω = 0.2ω_c) = 0.981 ∢ -11.31°

d) H(jω = ω_c) = 0.707 ∢ -45°

e) H(jω = 5ω_c) = 0.196 ∢ -78.69°

f) For ω = 0.2ω_c, $v_0(t)$ = 9.81 cos(2,540 t – 11.31°) Volts

g) For ω = ω_c, $v_0(t)$ = 7.07 cos(12,700 t - 45°) Volts

h) For ω = 5ω_c, $v_0(t)$ = 1.96 cos(63,500 t – 78.69°) Volts

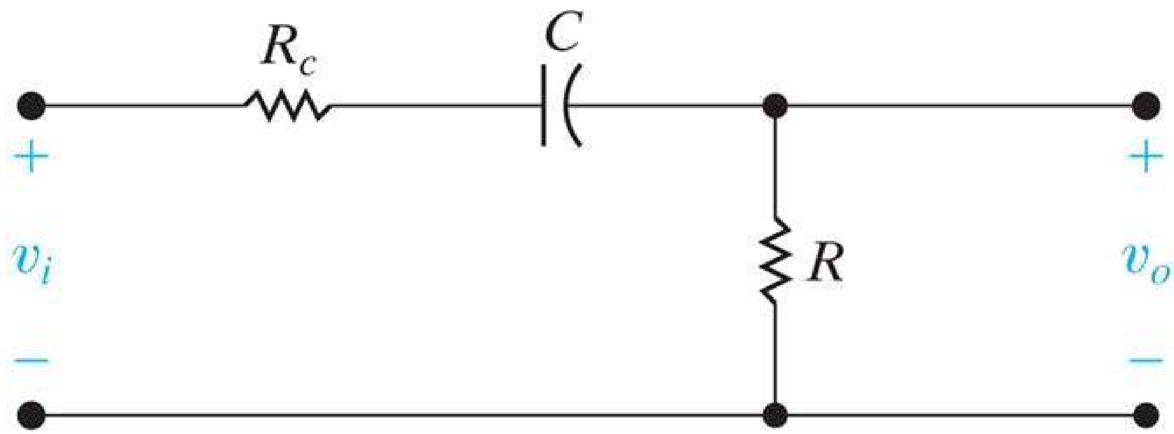
Correct

Marks for this submission: 20.00/20.00.

Question 4

Correct

Mark 20.00 out of 20.00



P14.11_9ed

Given: R_c = 12.5 kΩ (kilo Ohm) C = 5 nF R = 50 kΩ (kilo Ohm)

a) Find the cutoff frequency f_c for this high-pass filter.

f_c = 509.3 Hz

b) Find the H(jw) for

H(jw = w_c) = .57 at angle 45 ° (degrees)

H(jw = $0.2w_c$) = .16 at angle 78.69 °

H(jw = $5w_c$) = .78 at angle 11.31 °

c) If $v_i(t)$ = 500 cos(ωt) mV (milli V), write the steady-state output voltage $v_o(t)$ for

For ω = ω_c, $v_o(t)$ = 282.85 cos(wt + 45 °) mV (milli V)

For ω = $0.2\omega_c$, $v_o(t)$ = 78.45 cos(wt + 78.69 °) mV (milli V)

For ω = $5\omega_c$, $v_o(t)$ = 392.25 cos(wt + 11.31 °) mV (milli V)

a) f_c = 509.2958 Hz

b) Find the H(jω) for

H(jω = ω_c) = 0.5657 at angle 45°

H(jω = $0.2\omega_c$) = 0.1569 at angle 78.69°

H(jω = $5\omega_c$) = 0.7845 at angle 11.31°

c) If $v_i(t)$ = 500 cos(ωt), write the steady-state output voltage $v_o(t)$ for

For ω = ω_c, $v_o(t)$ = 282.850 cos(ωt + 45°) mV

For ω = $0.2\omega_c$, $v_o(t)$ = 78.450 cos(ωt + 78.69°) mV

For ω = $5\omega_c$, $v_o(t)$ = 392.250 cos(ωt + 11.31°) mV

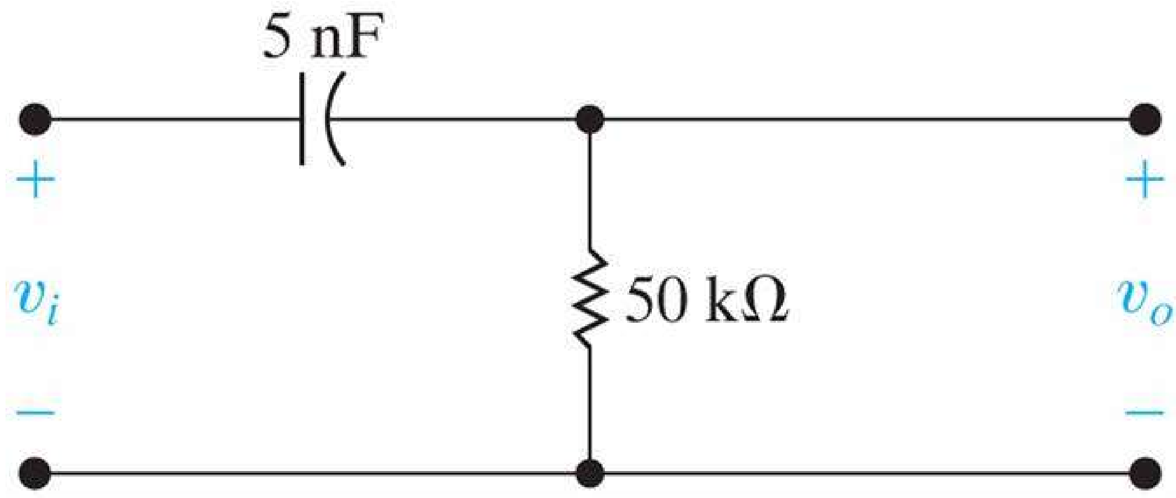
Correct

Marks for this submission: 20.00/20.00.

Question **5**

Correct

Mark 20.00 out of 20.00



P14.10_9ed

a) Find the cutoff frequency f_c for this high-pass filter.

f_c = 636.62 ✓ Hz

b) Find the H(jw) for

$H(jw = w_c)$ = .71 ✓ at angle 45 ✓ ° (degrees)

$H(jw = 0.2w_c)$ = .2 ✓ at angle 78.69 ✓ °

$H(jw = 5w_c)$ = .98 ✓ at angle 11.31 ✓ °

c) If $v_i(t) = 500 \cos(\omega t)$ mV (milli V), write the steady-state output voltage $v_o(t)$ for

For $\omega = \omega_c$, $v_o(t)$ = 353.55 ✓ cos(wt + 45 ✓ °) mV (milli V)

For $\omega = 0.2\omega_c$, $v_o(t)$ = 98.1 ✓ cos(wt + 78.7 ✓ °) mV (milli V)

For $\omega = 5\omega_c$, $v_o(t)$ = 490.3 ✓ cos(wt + 11.31 ✓ °) mV (milli V)

a) f_c = 636.6198 Hz

b) Find the H(jω) for

$H(j\omega = \omega_c) = 0.7071$ at angle 45°

$H(j\omega = 0.2\omega_c) = 0.1961$ at angle 78.69°

$H(j\omega = 5\omega_c) = 0.9806$ at angle 11.31°

c) If $v_i(t) = 500 \cos(\omega t)$, write the steady-state output voltage $v_o(t)$ for

For $\omega = \omega_c$, $v_o(t) = 353.550 \cos(\omega t + 45°)$ mV

For $\omega = 0.2\omega_c$, $v_o(t) = 98.050 \cos(\omega t + 78.69°)$ mV

For $\omega = 5\omega_c$, $v_o(t) = 490.30 \cos(\omega t + 11.31°)$ mV

Correct

Marks for this submission: 20.00/20.00.