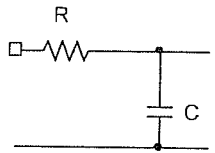
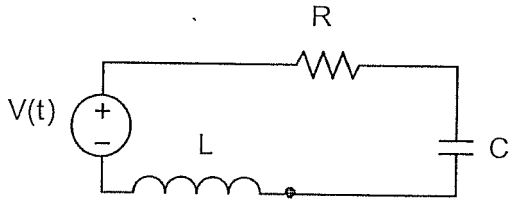
-8-Consider the following low-pass filter operating at f=50Hz. RC=1, find the phase shift introduced by this filter. (p16)

a. 1.567 rd
b. 0.00318 rd
c. 1.55 rd
d. 0.0199 rd
e. None of the above

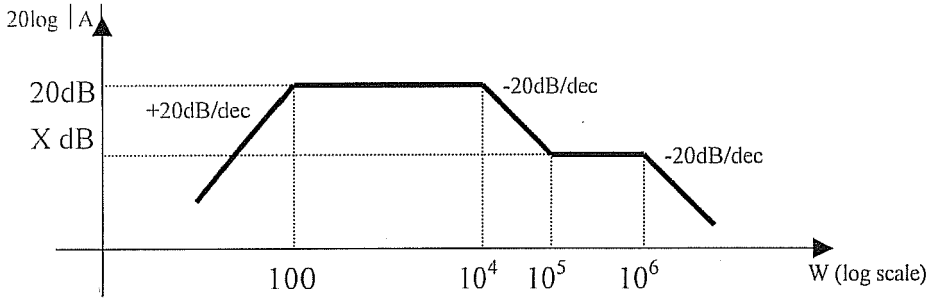


-9-A driving voltage v(t) is applied across the series RLC network. If the current I(t) is taken as the response and the voltage v(t) as the input, find the frequency at which the transfer function has $1/\sqrt{2}$ as magnitude . $R=\sqrt{2}\Omega$. (p16)

a. $\sqrt{L}/(2\pi\sqrt{C})$
b. $\sqrt{2L}/(2\pi\sqrt{C})$
c. $\sqrt{L}/(\pi\sqrt{C})$
d. $\sqrt{L}/(2\pi\sqrt{2C})$
e. None of the above



-1-Given the following Bode-plot (p19)



What is the value of X in dB?

(a) 0 (b) -10 (c) -20 (d)-30 (e) None of the above

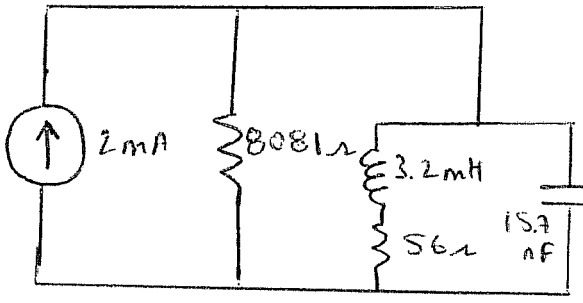
-2-Find the transfer function A(s) whose Bode-plot is shown above. (p19)

(a) $10^4(s+10^6) / (s+100)(s+10^4)(s+10^5)$
(b) $10^6(s+10^6) / (s+100)(s+10^4)(s+10^5)$
(c) $10^6(s^2+10^5 s) / (s+100)(s+10^4)(s+10^5)$
(d) $10^4 s(s+10^5) / (s+100)(s+10^4)(s+10^5)$
(e) None of the above

-3-A series resonant circuit has a resistance of 1KΩ and half-power frequencies of 20KHz and 100KHz. Find L and C. (p19)

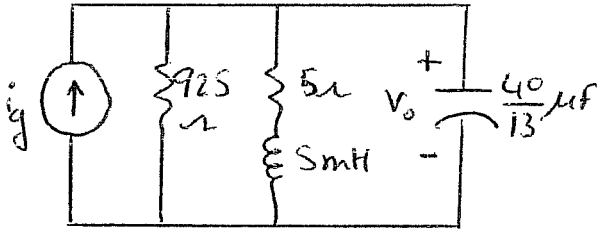
(a) 20.3mH, 5pF (b) 1.99mH, 6.35 nF (c) 10mH, 2μF
(d) 1.5 mH, 1.8μF (e) None of the above

-4- In the circuit shown, the resonant frequency is 22.3KHz and the bandwidth is 40.5KHz. How much additional parallel resistance is required to change the bandwidth to 6KHz? (p20)



(a) 1691 Ω (b) 5184Ω (c) 3640Ω
(d)8081Ω (e) None of the above

-5- In the circuit shown, the frequency of the sinusoidal current source is adjusted for unity power-factor resonance. Find the quality factor. (p20)



(a) 6.92 (b) 18.41 (c) 10.6
(d) 100.2 (e) None of the above

-6- Use Bode-diagram to answer question 6 & 7.
Given the following transfer function of a LP filter : $H(w)=\frac{100}{1+j.10^{-6}w}$
Find the output voltage when the input voltage is $V(t)=0.1\sin(10^8t)$ (p20)

(a) $10\sin(10^8t)$
(b) $0.1\sin(10^8t-90°)$
(c) $7.08\ \sin(10^8t-45°)$
(d) $10\sin(10^8t-63°)$
(e) None of the above

-7- Same question as -6-, but with $V(t)= 0.1\sin(2.5\times10^6t)$ (p20)

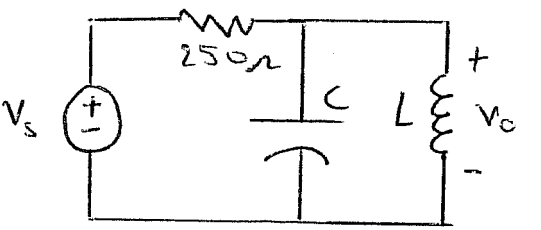
(a) $10\sin(2.5\times10^6t)$
(b) $4\sin(2.5\times10^6t-45°)$
(c) $4\sin(2.5\times10^6t-63°)$
(d) $3.2\sin(2.5\times10^6t-63°)$
(e) None of the above

-8- A series circuit has a resonance frequency of 150KHz and a bandwidth of 75KHz. Find the half-power frequencies. (p21)

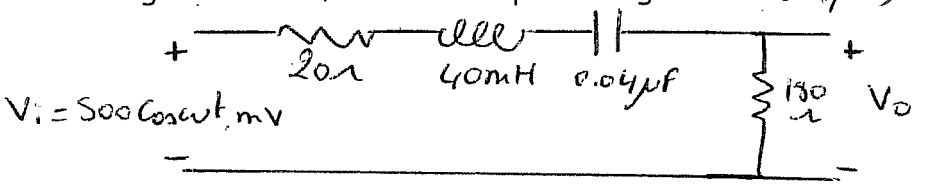
(a) 150KHz, 75KHz
(b) 117.1KHz, 192.1KHz
(c) 10KHz, 120KHz
(d) 45.3KHz, 13.8KHZ
(e) None of the above

-9- Consider the circuit shown, find C and L to give a band-pass filter having a resonant frequency of 2KHz and a bandwidth of 500Hz. (p21)

(a) 1.27μF, 4.97mH
(b) 4μF, 2.22mH
(c) 1.76μF, 20mH
(d) 2μf, 2.22mH
(e) None of the above

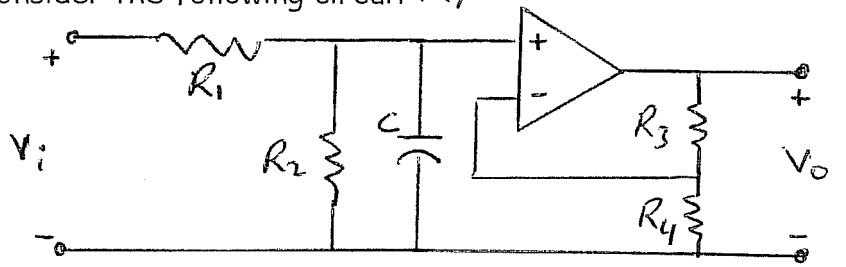


-10- For the given circuit, find the output voltage at $w=w_o$. (p21)



(a) 0.9Cos(5000t) mV
(b) 900Cos(2500t) mV
(c) 500Cos(2000t) mV
(d) 450Cos(25000t) mV
(e) None of the above

-11- Consider the following circuit : (p22)



What type of filters does this circuit represent?

(a) Low-pass filter
(b) High -pass filter
(c)Band-pass filter
(d)Band-stop filter
(e)None of the above

-12- If R1=2R2=4Ω, R3=2R4=10KΩ, and C=3μF, find the cutoff frequency(ies) of the filter in question-11-. (p22)

(a) 50Hz
(b) 40Hz
(c) 20-40Hz
(d) 30-50Hz
(e) None of the above

-13- Consider the band-stop filter having the following transfer function:

$$H(s)=\frac{12s^2+40s+50}{30s^2+125s+125}$$

What is the maximum value of this filter? (p22)

(a) -11dB
(b) 0dB
(c) 8dB
(d) -8dB
(e) None of the above

14- Find the width of the stop-band of the filter in question-13- (p23)

(a) 1.9 rd/s
(b) 0.83 rd/s
(c) 1.66 rd/s
(d) 2.3 rd/s
(e) None of the above

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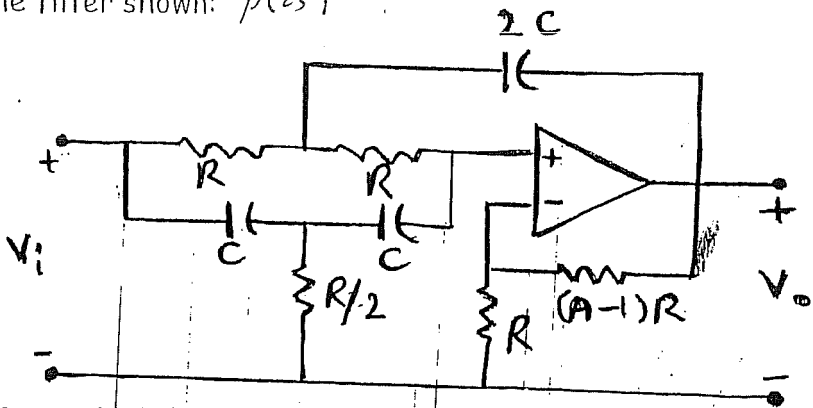
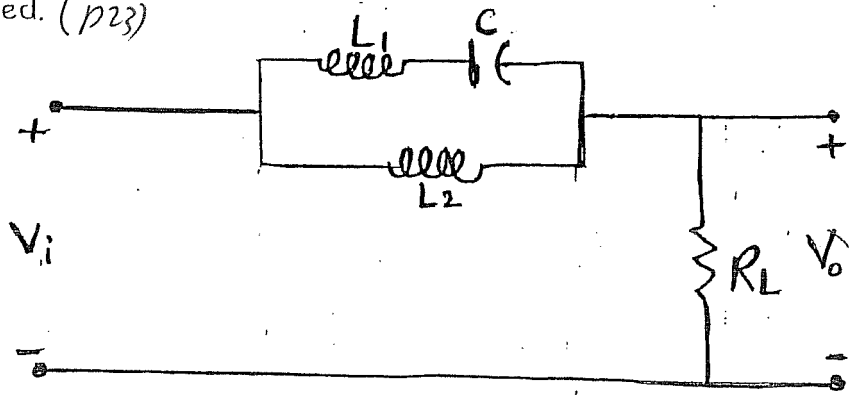
15- Consider the filter shown: p(23)



Given that Q=0.8 find the nature of this filter and the value of A.

(a) band-pass, A=2.375
(b) band-pass, A=3.375
(c) band-stop, A=2.375
(d) band-stop, A=3.375
(e) None of the above

16- The circuit shown is a double-tuned filter. If C=100pf, find L1 and L2 if a frequency of 400KHz is to be rejected and a frequency of 80 accepted. (p23)



(a) L1=0.396mH ,L2=1.19mH
(b) L1=9.95mH, L2=3.97mH
(c) L1=40mH, L2=119mH
(d) L1=396mH, L2=3.9mH
(e) None of the above

Answers: 1)a 2)c 3)b 4)a 5)e 6)b 7)c 8)b 9)a 10)d 11)a 12)b
13)d 14)b 15)d 16)a

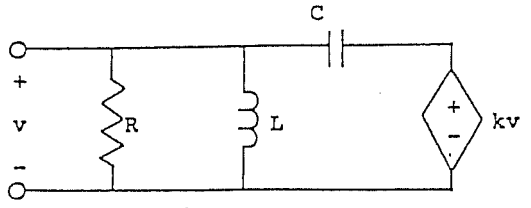


Figure 4.

5. Calculate the resonant frequency ω_0 and Q of the circuit shown in Fig. 4 when R = 1000 ohms, L = 1mH, C = 1μF and k = 0.9. (p66)

A.	ω_0 = 100 Krad/s,	Q = 10
B.	ω_0 = 20 Krad/s,	Q = 10
C.	ω_0 = 100 Krad/s,	Q = 50
D.	ω_0 = 20 Krad/s,	Q = 50
E.	None of the above	

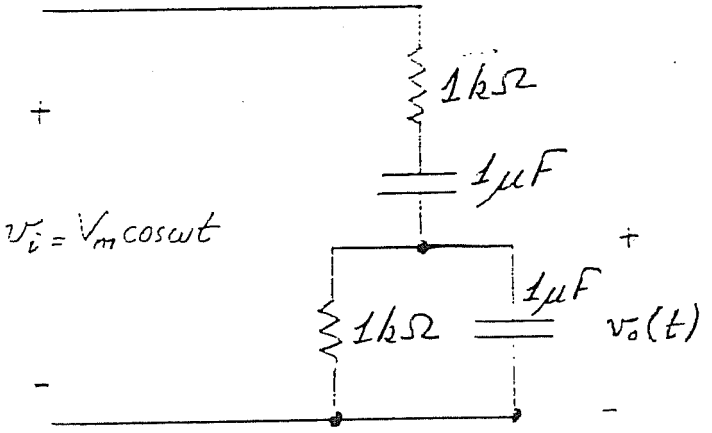


Figure 8.

10. Given the circuit of Fig. 8. Determine: (a) whether the response is bandpass or bandstop, (b) the frequency of maximum, or minimum, response, and (c) the half-power bandwidth. (p 68)

A. Bandstop; 3000 rad/s; 1000 rad/s
B. Bandpass; 3000 rad/s; 1000 rad/s
C. Bandstop; 1000 rad/s; 3000 rad/s
D. Bandpass; 1000 rad/s; 3000 rad/s
E. None of the above

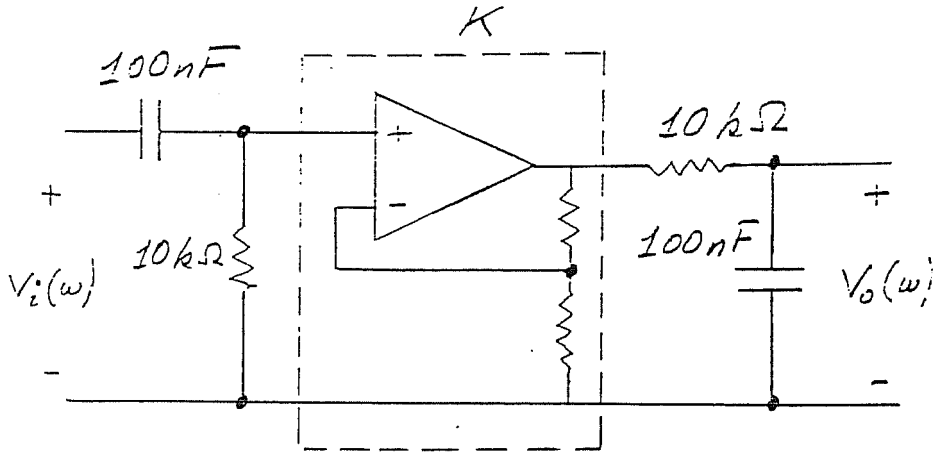


Figure 10.

12. In Fig. 10 the op amp circuit provides a gain of K. Determine K so that the maximum amplitude response is 20 db. Assume $\log_{10}2 = 0.3$. (p 69)

A. 30
B. 40
C. 26
D. 13
E. None of the above

16. Determine L and C in Fig. 14 so that V_o/V_i has the characteristic of a second-order Butterworth filter having $\omega_c = 2{,}000$ rad/s. (p 74)

A. 0.71 H; 1.41 μF
B. 0.24 H; 0.47 μF
C. 0.18 H; 0.35 μF
D. 0.35 H; 0.71 μF
E. None of the above

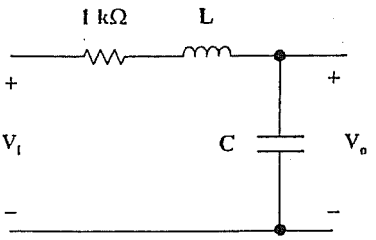


Figure 14

18. The op amp in Fig. 15 is ideal except that its gain is: $A(j\omega) = \dfrac{10^5}{1 + j\omega}$. Determine the half-power frequency of $|\, V_o/V_i \,|$ if $R_1 = 1k\Omega$ and $R_2 = 1k\Omega$ (p74)

A. 60.0 krad/s
B. 50.0 krad/s
C. 80.0 krad/s
D. 40.0 krad/s
E. None of the above

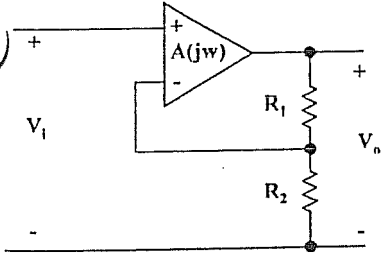


Figure 15

3. Find the transfer function H(s) that is related to the magnitude Bode plot represented in the figure below. (p99)

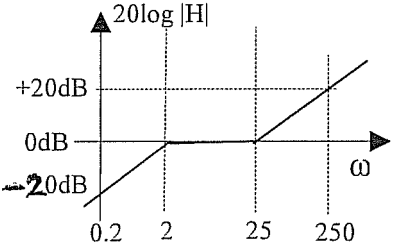
a) $\frac{(s+2)(s+25)}{25s}$

b) $\frac{25(s+2)}{s(s+25)}$

c) $\frac{(s+25)}{25s(s+2)}$

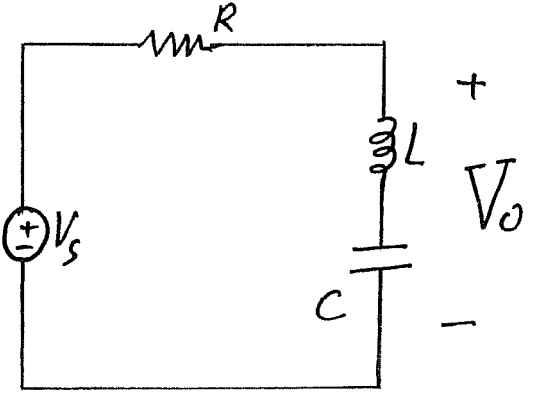
d) $\frac{s(s+25)}{25(s+2)}$

e) None of the above



6. Design the component values for the series RLC band reject filter shown below so that the center frequency is 4kHz and the quality factor is 5. Use a 500 nF capacitor. (p100)

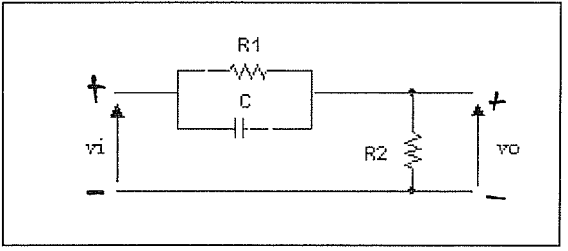
a) L=5.2 mH, R=22.67 Ω
b) L=3.17 mH, R=15.92 Ω
c) L=13.41 mH, R=25.37 Ω
d) L=1.73 mH, R=6.82 Ω
e) None of the above



9. The transfer function of a circuit is $\frac{100s}{s^2+100s+10^8}$. Determine Q and the bandwidth. (p 101)

A. 200; 100 rad/s
B. 200; 200 rad/s
C. 100; 100 rad/s
D. 100; 200 rad/s
E. None of the above

10. Determine what type of filter the network shown below represents (p102)



a) High pass filter
b) Low pass filter
c) Band pass Filter
d) Band reject Filter
e) None of the above

14. Given $H(s) = \dfrac{10^6}{s^2 + 1{,}600s + 10^6}$. Determine the attenuation in db at $\omega = 10^3$ rad/s. (p 107)

A. -4.1 db
B. $+4.1$ db
C. -5.1 db
D. $+5.1$ db
E. None of the above

18. Determine the frequency at which the response $V_0(s)/V_i(s)$ is maximum, given that $C_1 = 1\,\mu F$ and $C_2 = 1/3\,\mu F$. (p108)

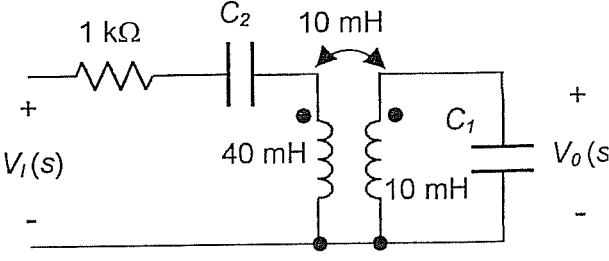
A. 0.5×10^4 rad/s

✓ B. 10^4 rad/s

C. 2×10^4 rad/s

D. 4×10^4 rad/s

E. None of the above



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