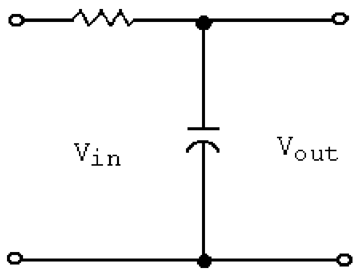
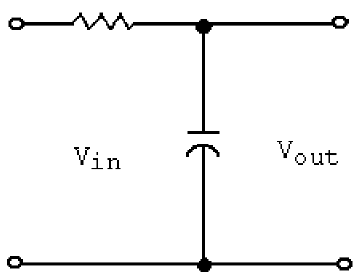
Chapter 1: The Decimal Number System

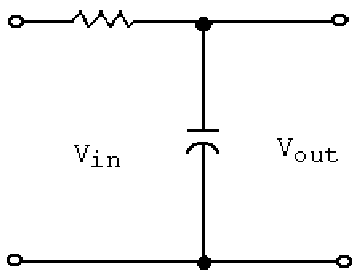
1. In the circuit below, V_{in} = 15 V and R = 5 Kê. What are V_O and X_C at f_{CO}?
   a. X_C = 7.07 Kê, V_O = 21.2 V
   b. X_C = 7.07 Kê, V_O = 15 V
   c. X_C = 5.05 Kê, V_O = 15 V
   d. X_C = 5.00 Kê, V_O = 10.6 V
   e. X_C = 3.5 Kê, V_O = 10.6 V



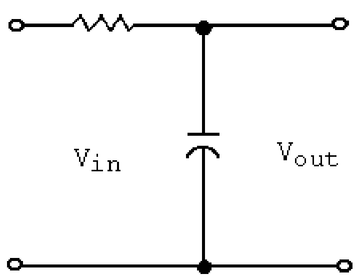
2. In the circuit below, V_{in} = 20 V, R = 12 Kê, and C = 0.003 æF. Find f_{CO}.
   a. 2.8 KHz
   b. 4.4 KHz
   c. 8.3 KHz
   d. 14 KHz
   e. 84 KHz



3. In the circuit below, V_{in} = 35 V, R = 20 Kê, and f_{CO} = 23 KHz. Find V_O and C at f_{CO}.
   a. V_O = 17.5 V, C = 346 pF
   b. V_O = 17.5 V, C = 230 pF
   c. V_O = 24.8 V, C = 346 pF
   d. V_O = 24.8 V, C = 200 pF
   e. V_O = 35.0 V, C = 530 pF



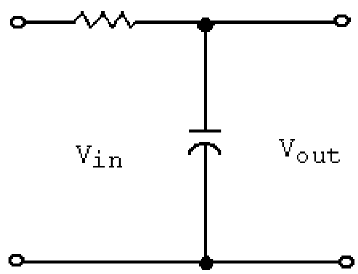
4. In the circuit below, V_{in} = 35 V, R = 20 Kê, and f_{CO} = 23 Khz. What is the circuit impedance and I_{max} for the circuit?
   a. Z = 28.3 Kê, I = 1.24 mA
   b. Z = 40.0 Kê, I = 1.75 mA
   c. Z = 39.2 Kê, I = 3.50 mA
   d. Z = 28.3 Kê, I = 1.75 mA
   e. Z = 14.2 Kê, I = 1.24 mA



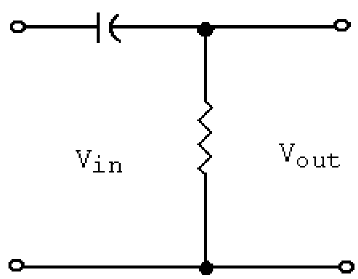
5. In a low pass filter, V_{in} = 18.5V and R = 4.5 Kê. Find X_C, I P and V_o at f_{co}.

6. In a low pass filter, V_{in} = 7V, R = 3.3 Kê, C = 180 nF. Find F_{co}, and V_{out} at f_{co}.

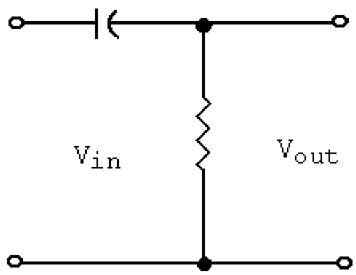
7. Referring to the circuit below, the low pass filter has the following characteristic(s):
   a. The output voltage is equal to V_{in} at f_{CO}
   b. The power output is 50% of max. at f_{CO}
   c. The output decreases as frequency increases
   d. The power output is 50% of max. at f_{CO} and the output decreases as frequency increases



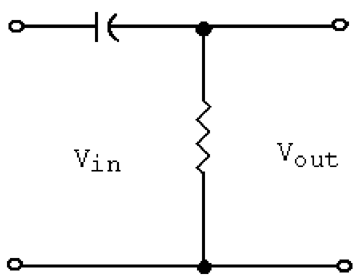
8. Below is a circuit for a high pass filter. As the frequency increases, what happens to V_R and V_C?
   a. V_R decreases, V_C increases.
   b. V_R remains the same, V_C decreases.
   c. V_R increases, V_C remains the same.
   d. V_R increases, V_C decreases.
   e. V_R increases, V_C increases.



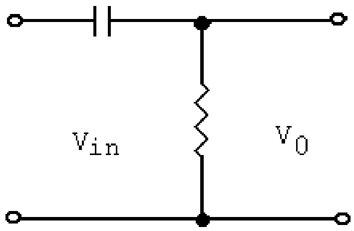
9. In the circuit below, the frequency is increased from 100 Hz to a maximum value. At what frequency does V_O reach the cutoff frequency if R = 100 ê and C = 0.01 æF?
   a. 2.53 KHz
   b. 159.2 KHz
   c. 8.11 KHz
   d. 14.33 KHz
   e. 11.93 KHz



10. If R = 100 ê and C = 0.01 æF, what is the power dissipated in the circuit below at f_{CO} if V_{in} = 20 V?
   a. 4.00 w
   b. 2.82 w
   c. 2.00 w
   d. 1.41 w
   e. 1.00 w

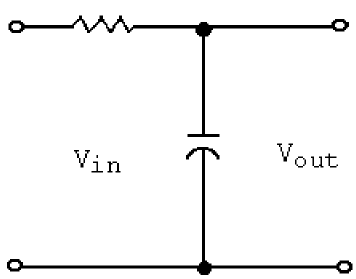


11. In the circuit below, find f_{CO} and V_O if V_{in} = 42 V, R = 22 K, and C = 0.00015 æF.
    a. V_O = 29.7 V, f_{CO} = 48.2 KHz
    b. V_O = 21.0 V, f_{CO} = 48.2 KHz
    c. V_O = 21.0 V, f_{CO} = 31.7 KHz
    d. V_O = 29.7 V, f_{CO} = 31.7 KHz
    e. V_O = 21.0 V, f_{CO} = 34.1 KHz



12. What is the value of C required to cause a low pass filter to cutoff at 18 KHz if R = 13.7 Kê?
    a. 0.00015 æF
    b. 645 pF
    c. 0.004 æF
    d. 345 pF
    e. 0.0006 æF

13. In the circuit below, V_{in} = 18 V and R = 18 Kê and C = 0.001 æF. What is f_{CO}?



14. Given a series RC circuit, what is the relationship of R and X_C at the frequency cutoff?

15. Using Thevenin's Theorem, find the equivalent circuit for a low pass filter when R_1 = 5.6 Kê, R_2 = 6.8 Kê, R_3 = 10 Kê, and C = 1200 pF.

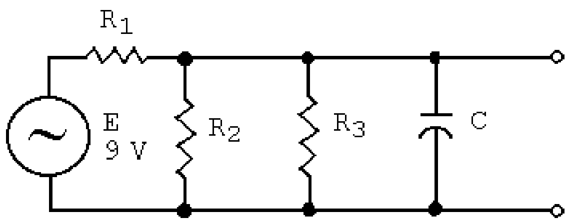
a. R_{TH} = 13.1 Kê, C = 1200 pF, output across R

b. R_{TH} = 2.3 Kê, C = 1200 pF, output across C

c. R_{TH} = 11.2 Kê, C = 1200 pF, output across C

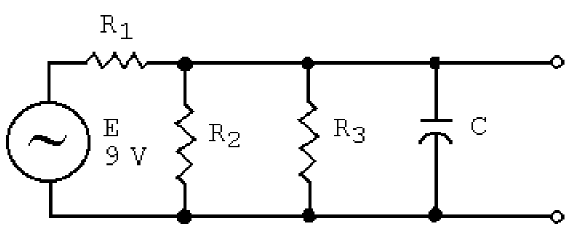
d. R_{TH} = 12.4 Kê, C = 848 pF, output across R

e. R_{TH} = 13.2 Kê, C = 1200 pF, output across R



16. Using Thevenin's Theorem, what is f_{CO} of an equivalent circuit for a lowpass filter when R_1 = 5.6 Kê, R_2 = 6.8 Kê, R_3 = 10 Kê, and C = 1200 pF.

a. 15.1 KHz
b. 11.7 KHz
c. 56.4 KHz
d. 8.7 KHz
e. 6.2 KHz



17. In the circuit below, R_1 = 3.3 Kê, R_2 = 5.6 Kê, R_3 = 4.7 Kê, and C = 846 pF. Find V_O and R_N of an equivalent Norton circuit.

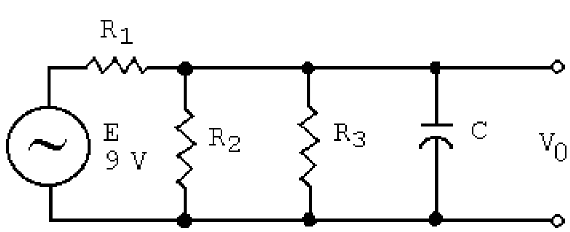
a. V_O = 15.0 V, R_N = 4.7 Kê

b. V_O = 8.5 V, R_N = 5.86 Kê

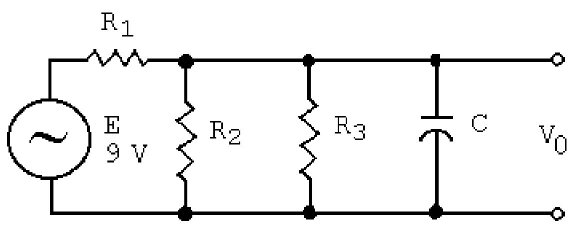
c. V_O = 7.5 V, R_N = 2.56 Kê

d. V_O = 6.5 V, R_N = 3.3 Kê

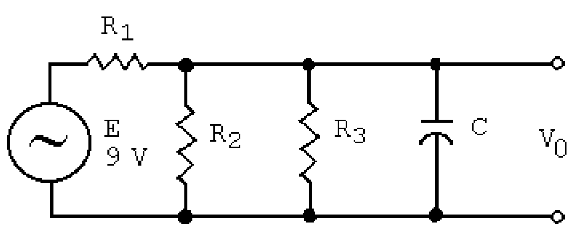
e. V_O = 3.9 V, R_N = 1.4 Kê



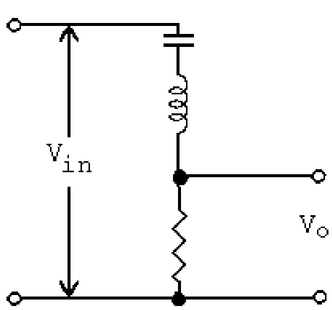
18. In the circuit below, R_1 = 3.3 Kê, R_2 = 5.6 Kê, R_3 = 4.7 Kê, and C = 846 pF. What is f_{CO} of an equivalent Norton circuit?
   a. 843 KHz
   b. 521 KHz
   c. 470 KHz
   d. 213 KHz
   e. 131 KHz



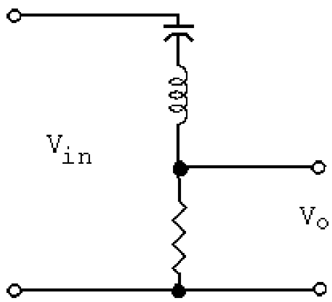
19. In the circuit below, R_1 = 3.3 Kê, R_2 = 5.6 Kê, R_3 = 4.7 Kê, and C = 846 pF. What is I_C of an equivalent Norton circuit when f = f_{CO}?
   a. 4.5 mA
   b. 10.7 mA
   c. 1.9 mA
   d. 2.7 mA
   e. 1.8 mA



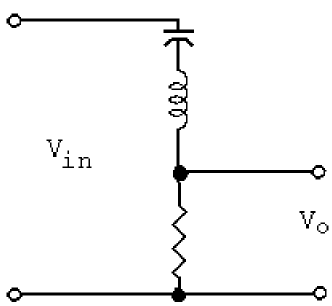
20. In the series resonant circuit below, V_{in} = 8.0 V and R = 10 Kê. Find V_O.
   a. 3.3 V
   b. 4.0 V
   c. 5.6 V
   d. 6.6 V
   e. 8.0 V



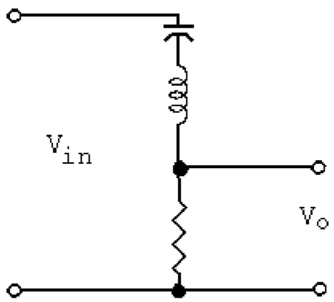
21. In the circuit below, V_{in} = 7 V, R = 250 ê, x_C = 1000 ê at f_r, and C = 90 pF. Find f_r and Q.
    a. f_r = 3.1 MHz, Q = 10
    b. f_r = 1.8 MHz, Q = 4
    c. f_r = 1.8 MHz, Q = 1.8
    d. f_r = 1.2 MHz, Q = 6
    e. f_r = 1.0 MHz, Q = 4



22. In the circuit below, V_{in} = 7 V, R = 250 ê, x_C = 1000 ê, and C = 90 pF. Find the bandwidth.
    a. 310 KHz
    b. 1000 KHz
    c. 450 KHz
    d. 200 KHz
    e. 250 KHz



23. In the circuit below, V_{in} = 7 V, R = 250 ê, x_C = 1000 ê, and C = 90 pF. What are the values of V_O and I at f_1?
    a. V_O = 4.95 V, I = 19.8 mA
    b. V_O = 6.21 V, I = 19.8 mA
    c. V_O = 7.00 V, I = 19.8 mA
    d. V_O = 5.55 V, I = 22.2 mA
    e. V_O = 7.00 V, I = 28.0 mA



24. A series resonant circuit is used as a bandpass filter. What is Q if BW = 3 KHz and f_1 = 10 KHz?
    a. 3.8
    b. 3.3
    c. 4.3
    d. 6.3
    e. 7.6

25. A series resonant circuit has V_{in} = 9.0 V, Q = 6, and f_r = 150 KHz. Find BW and V_O at f_1.
    a. BW = 25.0 KHz, V_O = 6.4 V
    b. BW = 20.8 KHz, V_O = 9.0 V
    c. BW = 29.2 KHz, V_O = 9.0 V
    d. BW = 230 KHz, V_O = 6.4 V
    e. BW = 277 KHz, V_O = 4.5 V

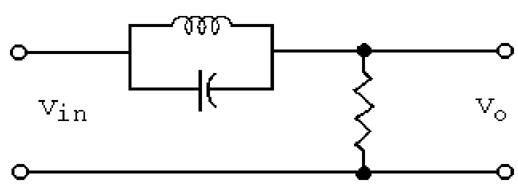
26. A series resonant circuit has V_{in} = 6.2 V, R = 500 ê, f_r = 1.4 kHz and Q = 15. Find BW, f_1, and f_2.

27. For a low pass filter, f_{CO} = 15 KHz and V_{in} = 22 V. What is V_O when the input frequency is 6.1 KHz?
    a. 20.4 V
    b. 11.0 V
    c. 15.6 V
    d. 31.1 V
    e. 22.0 V

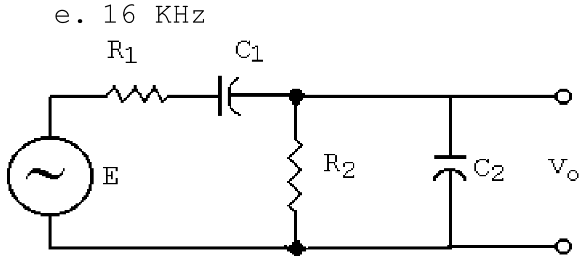
28. Find the power dissipated at f_{CO} in a high pass RC filter circuit when R = 4.7 Kê, C = 500 pF, and V_{in} = 30 V.
   a. 58.3 mw
   b. 47.0 mw
   c. 95.6 mw
   d. 116.5 mw
   e. 191.5 mw

29. A low pass filter has R = 18 Kê, C = 0.01 F, and V_{in} = 10 V. Find V_O and I_C at f_{CO}.
   a. I_C = 0.39 mA, V_O = 10.0 V
   b. I_C = 1.82 mA, V_O = 5.0 V
   c. I_C = 1.82 mA, V_O = 7.1 V
   d. I_C = 0.39 mA, V_O = 7.1 V
   e. I_C = 0.56 mA, V_O = 10.0 V

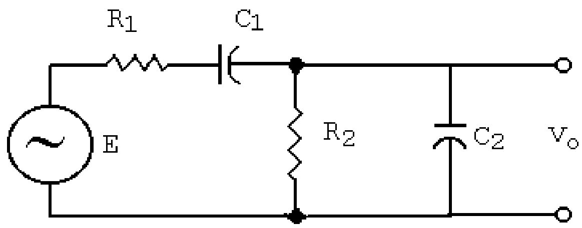
30. The circuit shown below:
   a. Has maximum output at f_r
   b. Has minimum output at f_r
   c. Is a band reject filter
   d. Has a maximum output at f_r and is a band reject filter
   e. Has a minimum output at f_r and is a band reject filter



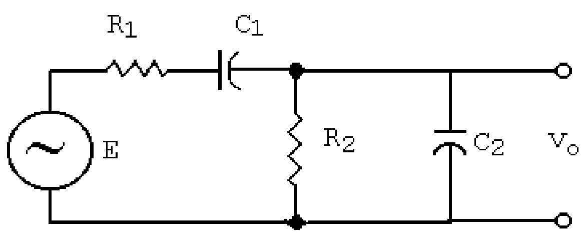
31. Find f_1 in the circuit below when R_1 = 1 Kê, R_2 = 4 Kê, C_1 = 0.1 æF, C_2 = 700 pF, and E = 20 V.
   a. 1 KHz
   b. 318 H_3
   c. 4 KHz
   d. 8 KHz
   e. 16 KHz



32. What is f_2 in the circuit below when R_1 = 1 Kê, R_2 = 4 Kê, C_1 = 0.1 æF, C_2 = 700 pF, and E = 20 V?
    a. 390 KHz
    b. 284 KHz
    c. 169 KHz
    d. 71 KHz
    e. 57 KHz



33. Find the mid-frequency output voltage in the circuit below when R_1 = 1 Kê, R_2 = 4 Kê, C_1 = 0.1 æF, C_2 = 700 pF, and E = 20 V.
    a. 4 V
    b. 5 V
    c. 10 V
    d. 16 V
    e. 20 V



34. In a bandpass filter, f_1 = 45 KHz and f_2 = 60 KHz. Find f_m.
    a. 51.0 KHz
    b. 52.0 KHz
    c. 52.5 KHz
    d. 54.2 KHz
    e. 55.7 KHz

35. What is f_m for a bandbass filter when f_1 = 20.0 MHz and f_2 = 28.9 MHz?

36. In a bandpass filter, the lower cut-off frequency, f_r, is best described by:

a. C_N
ÄÄÄÄ
2ãC_2

b. ÚÄÄÄÄÄÄÄ
ûf_1 ú f_2

c. 1
ÄÄÄÄÄÄÄ
2ã$R_{TH}C_1$

37. In a bandpass filter, Q is best described by:

a. ÚÄÄ
2ãûLC

b. BW
ÄÄ
2

c. fr
ÄÄ
BW

d. 2ãfL

1. d
2. b
3. c
4. a
5. X_C = 4.5 Kê
   I = 2.91 mA
   P = 38.03 mW
   V_O = 13.08 V
6. f_{co} = 267.9 Hz
   V_{out} = 4.95 V
7. d
8. d
9. b
10. c
11. a
12. b
13. f_{CO} = 8.84 KHz
14. X_C = R
15. b
16. c
17. e
18. e
19. c
20. e
21. b
22. c
23. a
24. a
25. a
26. BW = 93.3 Hz
    f_1 = 1.35 kHz
    f_2 = 1.45 kHz
27. a
28. c
29. d
30. e
31. b
32. b
33. d
34. b
35. f_m = 24.04 MHz.
36. c
37. c