

- Why will a circuit with R and X_C in series be less capacitive as the frequency of the applied voltage is increased?
- Define the following: coupling capacitor, sawtooth voltage, capacitive voltage divider.
- State two troubles possible in coupling capacitors, and describe briefly how you would check the capacitor with an ohmmeter.
- Explain the function of R and C in an RC coupling circuit.

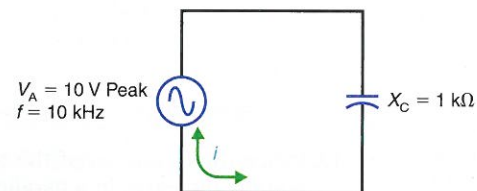
Problems

SECTION 18-1 SINE WAVE v_C LAGS i_C BY 90°

18-1 In Fig. 18-11, what is the

- peak value of the capacitor voltage, V_C ?
- peak value of the charge and discharge current, i_C ?
- frequency of the charge and discharge current?
- phase relationship between V_C and i_C ?

Figure 18-11



- 18-2 In Fig. 18-11, what is the value of the capacitor current, i_C , at the instant when V_C equals
- its positive peak of +10 V?
 - 0 V?
 - its negative peak of -10 V?

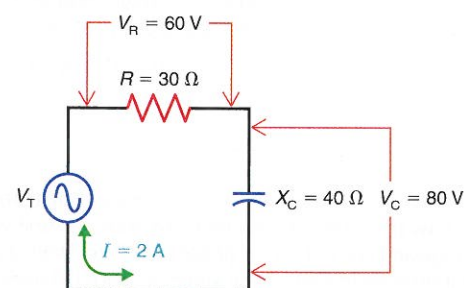
- 18-3 In Fig. 18-11, draw the phasors representing V_C and i_C using
- V_C as the reference phasor.
 - i_C as the reference phasor.

SECTION 18-2 X_C AND R IN SERIES

18-4 In Fig. 18-12, how much current, I , is flowing

- through the $30\text{-}\Omega$ resistor, R ?
- through the $40\text{-}\Omega$ capacitive reactance, X_C ?
- to and from the terminals of the applied voltage, V_T ?

Figure 18-12



- Explain briefly why a capacitor can block dc voltage.
- What is the waveshape of i_C for a sine wave v_C ?
- Explain why the impedance Z_{T0} of a parallel RC circuit decreases as the frequency increases.
- Explain why θ_Z in a series RC circuit increases (becomes more negative) as frequency decreases.

18-5 In Fig. 18-12, what is the phase relationship between

- I and V_R ?
- I and V_C ?
- V_C and V_R ?

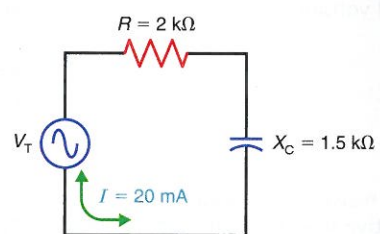
18-6 In Fig. 18-12, how much is the applied voltage, V_T ?

18-7 Draw the phasor voltage triangle for the circuit in Fig. 18-12. (Use V_R as the reference phasor.)

18-8 In Fig. 18-13, solve for

- the resistor voltage, V_R .
- the capacitor voltage, V_C .
- the total voltage, V_T .

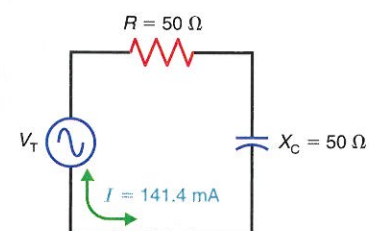
Figure 18-13



18-9 In Fig. 18-14, solve for

- the resistor voltage, V_R .
- the capacitor voltage, V_C .
- the total voltage, V_T .

Figure 18-14



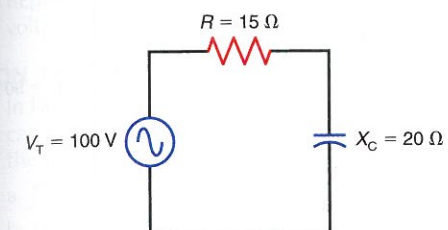
18-10 In a series RC circuit, solve for the applied voltage, V_T if

- $V_R = 40\text{ V}$ and $V_C = 40\text{ V}$.
- $V_R = 10\text{ V}$ and $V_C = 5\text{ V}$.
- $V_R = 48\text{ V}$ and $V_C = 72\text{ V}$.
- $V_R = 12\text{ V}$ and $V_C = 18\text{ V}$.

SECTION 18-3 IMPEDANCE Z TRIANGLE

18-11 In Fig. 18-15, solve for Z_T , I , V_C , V_R , and θ_Z .

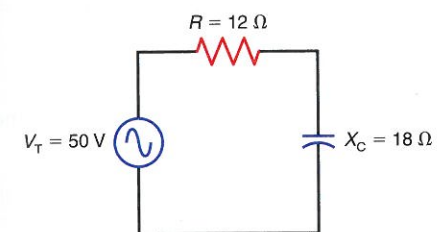
Figure 18-15



18-12 Draw the impedance triangle for the circuit in Fig. 18-15. (Use R as the reference phasor.)

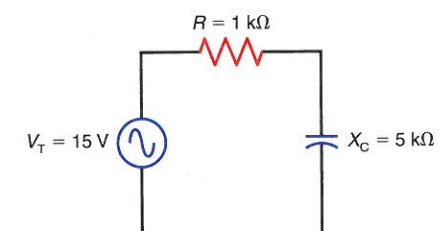
18-13 In Fig. 18-16, solve for Z_T , I , V_C , V_R , and θ_Z .

Figure 18-16



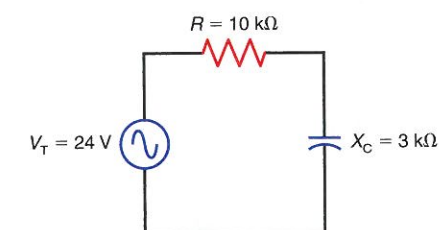
18-14 In Fig. 18-17, solve for Z_T , I , V_C , V_R , and θ_Z .

Figure 18-17



18-15 In Fig. 18-18, solve for Z_T , I , V_C , V_R , and θ_Z .

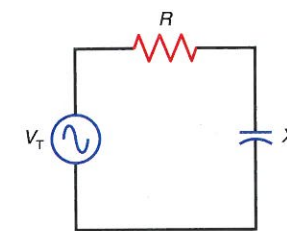
Figure 18-18



18-16 In Fig. 18-19, solve for Z_T , I , V_C , V_R , and θ_Z for the following circuit values:

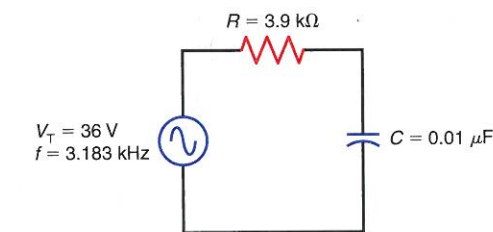
- $X_C = 30\ \Omega$, $R = 40\ \Omega$, and $V_T = 50\text{ V}$.
- $X_C = 200\ \Omega$, $R = 200\ \Omega$, and $V_T = 56.56\text{ V}$.
- $X_C = 10\ \Omega$, $R = 100\ \Omega$, and $V_T = 10\text{ V}$.
- $X_C = 100\ \Omega$, $R = 10\ \Omega$, and $V_T = 10\text{ V}$.

Figure 18-19



18-17 In Fig. 18-20, solve for X_C , Z_T , I , V_C , V_R , and θ_Z .

Figure 18-20



18-18 In Fig. 18-20, what happens to each of the following quantities if the frequency of the applied voltage increases?

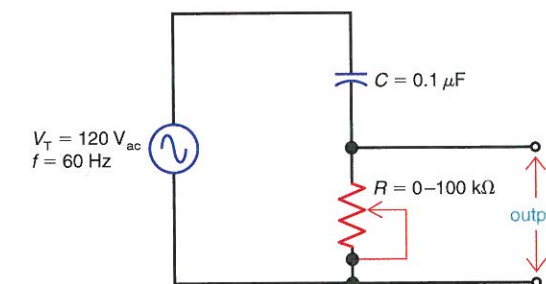
- X_C .
- Z_T .
- I .
- V_C .
- V_R .
- θ_Z .

18-19 Repeat Prob. 18-18 if the frequency of the applied voltage decreases.

SECTION 18-4 RC PHASE-SHIFTER CIRCUIT

18-20 With R set to $50\text{ k}\Omega$ in Fig. 18-21, solve for X_C , Z_T , I , V_R , V_C , and θ_Z .

Figure 18-21



18-21 With R set to $50\text{ k}\Omega$ in Fig. 18-21, what is the phase relationship between

- V_T and V_R ?
- V_T and V_C ?

18-22 Draw the phasors for V_R , V_C , and V_T in Fig. 18-21 with R set at $50\text{ k}\Omega$. Use V_T as the reference phasor.