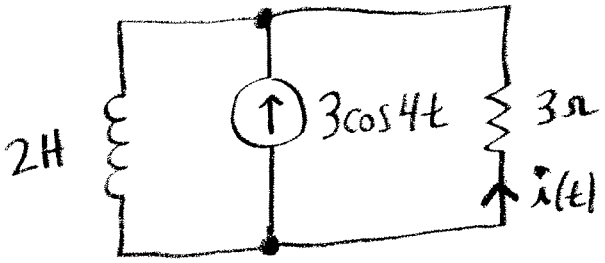
10. Assuming a frequency of ω rad/s, convert the phasor voltage $7 + j3$ V to the time domain.

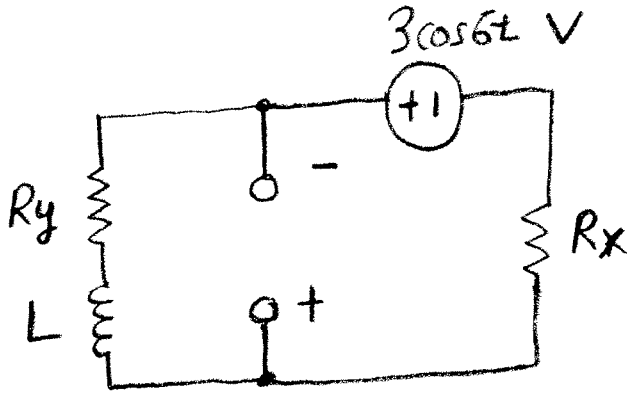
11. Determine the current $i(t)$, in the time domain, for the following circuit. It is not necessary to evaluate the trigonometric functions, but no j's should be present in the final answer.



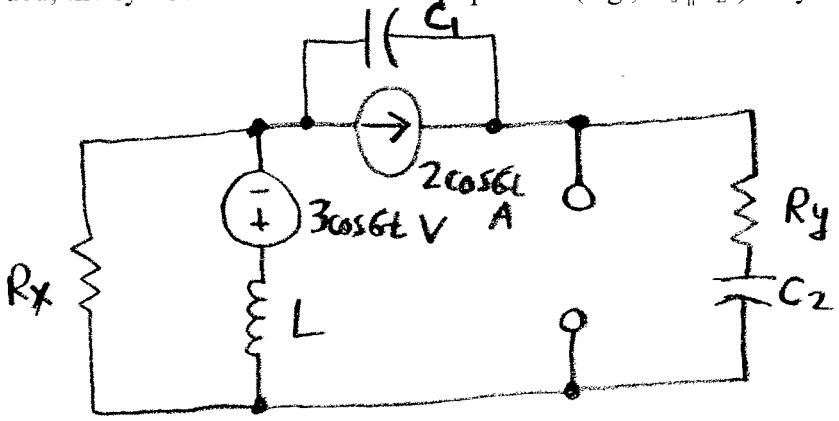
$-3\angle 0° \times \frac{j8}{j8+3}$

$j4 \| 2 = j8\ \Omega$

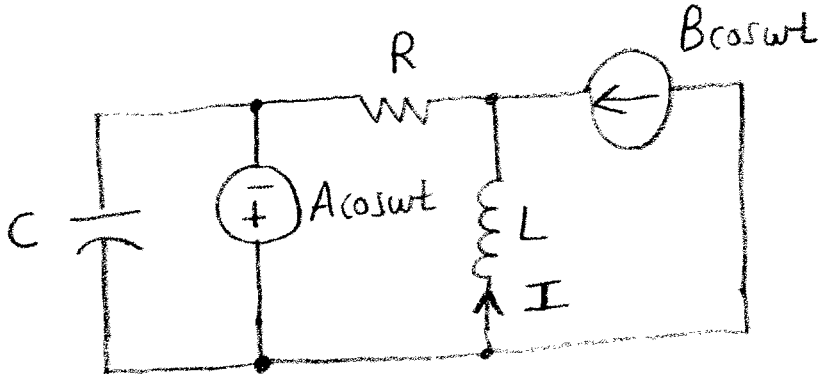
12. Determine the Thévenin voltage seen by the two terminals for the given circuit in the frequency domain using voltage division, current division, and/or Ohm's law. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



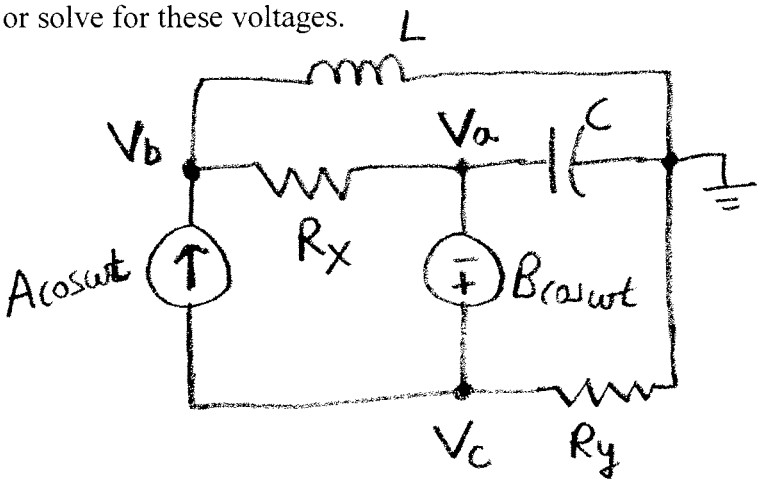
13. Determine the Thévenin (or equivalent) impedance seen by the two terminals for the given circuit in the frequency domain. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



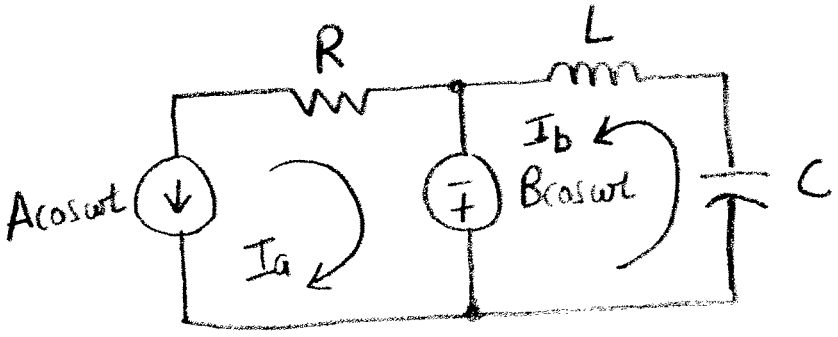
14. Using superposition, determine the current I in the frequency domain Do not simplify the expression. If needed, the symbol for two resistive elements in parallel (e.g., $R_s \| R_L$) may be used.



15. For the given circuit, using the labeled voltages, write all of the node voltage equations in the frequency domain as done in class. Do not simplify the expressions or solve for these voltages.



16. For the given circuit, using the labeled currents, write all of the mesh current equations in the frequency domain as done in class. Do not simplify the expressions or solve for these currents.



1 10. $\sqrt{7^2+3^2}\cos\left(\omega t + \tan^{-1}\frac{3}{7}\right)$ V

4 11. $\frac{-24}{\sqrt{8^2+3^2}}\cos\left(4t + 90^\circ - \tan^{-1}\frac{8}{3}\right)$ A

2 12. $-3\angle 0^\circ \times \frac{j\omega L + R_y}{j\omega L + R_y + R_x}$ where $\omega = 6$

1 13. $\left[(R_x \| j\omega L) + \frac{1}{j\omega C_1}\right] \| \left(R_y + \frac{1}{j\omega C_2}\right)$ where $\omega = 6$

6 14. $-B\angle 0^\circ \times \frac{R}{R + j\omega L} + \frac{A\angle 0^\circ}{R + j\omega L}$

$V_c - V_a = B\angle 0^\circ$

$\frac{V_b - V_a}{R_x} + \frac{V_b - 0}{j\omega L} - A\angle 0^\circ = 0$

6 15. $\frac{V_c - 0}{R_y} + A\angle 0^\circ + \frac{V_a - 0}{\frac{1}{j\omega C}} + \frac{V_a - V_b}{R_x} = 0$

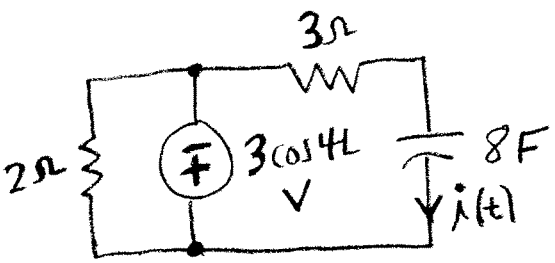
$I_a = -A\angle 0^\circ$

$\frac{1}{j\omega C} I_b + j\omega L I_b - B\angle 0^\circ = 0$

4 16.

10. Assuming a frequency of ω rad/s, convert the phasor voltage $5 - j8$ V to the time domain.

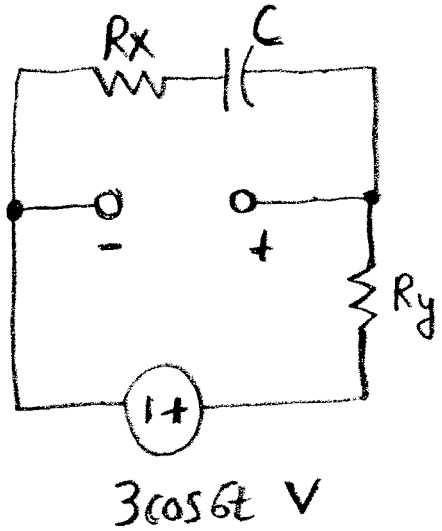
11. Determine the current $i(t)$, in the time domain, for the following circuit. It is not necessary to evaluate the trigonometric functions, but no j's should be present in the final answer.



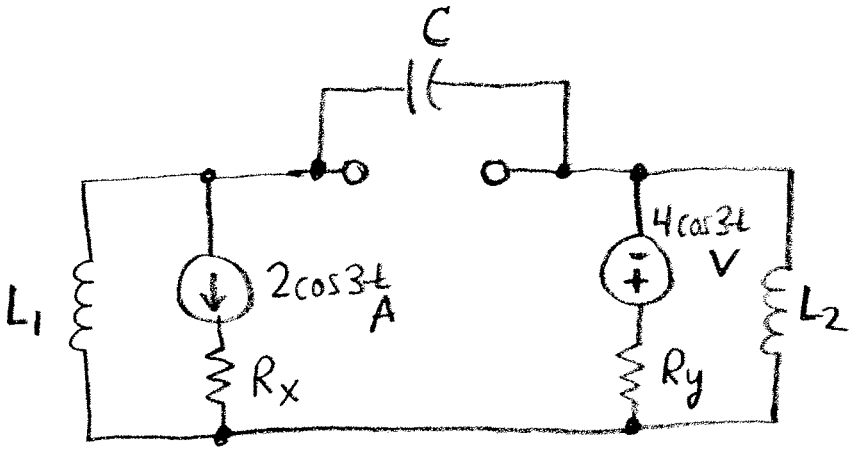
$$I = \frac{-3\angle 0^\circ}{3 + \frac{1}{j4/8}}$$

$$= \frac{-3\angle 0^\circ}{3 - j/32}$$

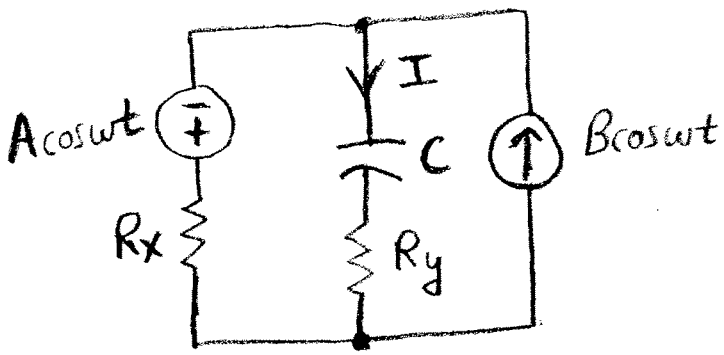
12. Determine the Thévenin voltage seen by the two terminals for the given circuit in the frequency domain using voltage division, current division, and/or Ohm's law. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



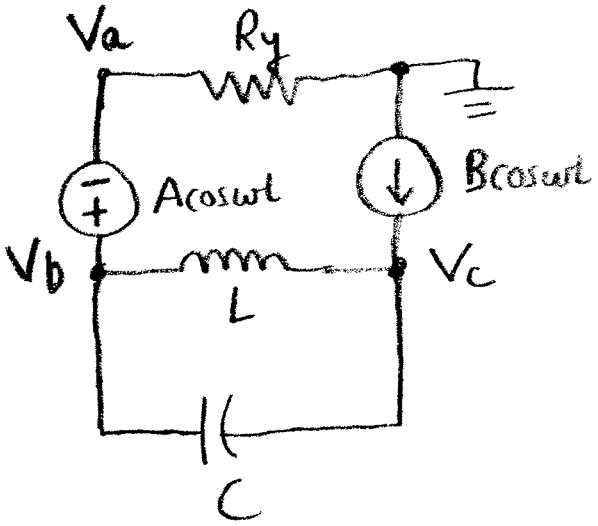
13. Determine the Thévenin (or equivalent) impedance seen by the two terminals for the given circuit in the frequency domain. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



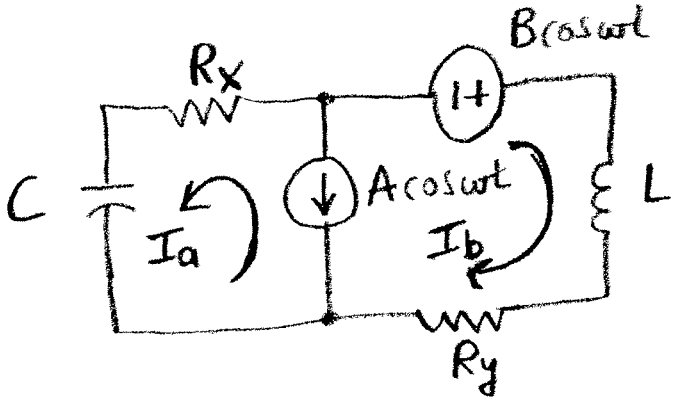
14. Using superposition, determine the current I in the frequency domain Do not simplify the expression. If needed, the symbol for two resistive elements in parallel (e.g., $R_s \| R_L$) may be used.



15. For the given circuit, using the labeled voltages, write all of the node voltage equations in the frequency domain as done in class. Do not simplify the expressions or solve for these voltages.



16. For the given circuit, using the labeled currents, write all of the mesh current equations in the frequency domain as done in class. Do not simplify the expressions or solve for these currents.



1 10. $\sqrt{5^2+8^2}\cos\left(\omega t + \tan^{-1}\frac{-8}{5}\right)$ V

4 11. $\frac{-3}{\sqrt{3^2+\left(\frac{1}{32}\right)^2}}\cos\left(4t - \tan^{-1}\frac{\frac{1}{32}}{3}\right)$ A

2 12. $3\angle 0^\circ \times \frac{Rx + \frac{1}{j6C}}{Rx + \frac{1}{j6C} + Ry}$ V

1 13. $\left[(Ry \,//\, j\omega L_2) + j\omega L_1\right] // \frac{1}{j\omega C}$ where $\omega = 3$

6 14. $\frac{-A\angle 0^\circ}{Rx + Ry + \frac{1}{j\omega C}} + B\angle 0^\circ * \frac{Rx}{Rx + Ry + \frac{1}{j\omega C}}$

$V_b - V_a = A\angle 0^\circ$

c b $\frac{V_a - 0}{R} + \frac{V_b - V_c}{j\omega L} + \frac{V_b - V_c}{1/j\omega C} = 0$

c c $-B\angle 0^\circ + \frac{V_c - V_b}{j\omega L} + \frac{V_c - V_b}{1/j\omega C} = 0$

6 15.

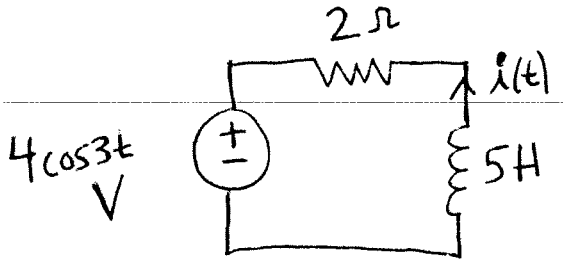
$A\angle 0^\circ = -I_a - I_b$

$Rx\, I_a + \frac{1}{j\omega C} I_a + Ry(-I_b) + j\omega L(-I_b) + B\angle 0^\circ = 0$

4 16.

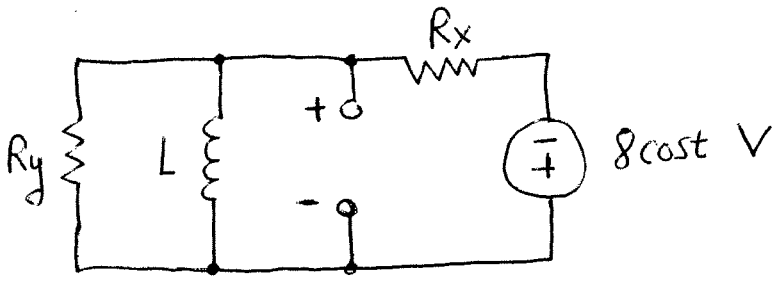
10. Assuming a frequency of ω rad/s, convert the phasor voltage $3 + j8$ V to the time domain.

11. Determine the current $i(t)$, in the time domain, for the following circuit. It is not necessary to evaluate the trigonometric functions, but no j's should be present in the final answer.

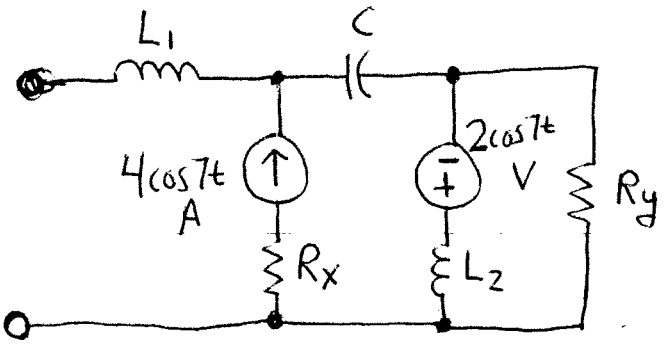


$$I = \frac{-4\angle 0^\circ}{2 + j15}$$

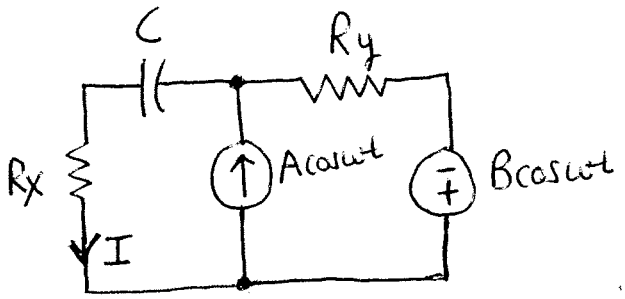
12. Determine the Thévenin voltage seen by the two terminals for the given circuit in the frequency domain using voltage division, current division, and/or Ohm's law. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



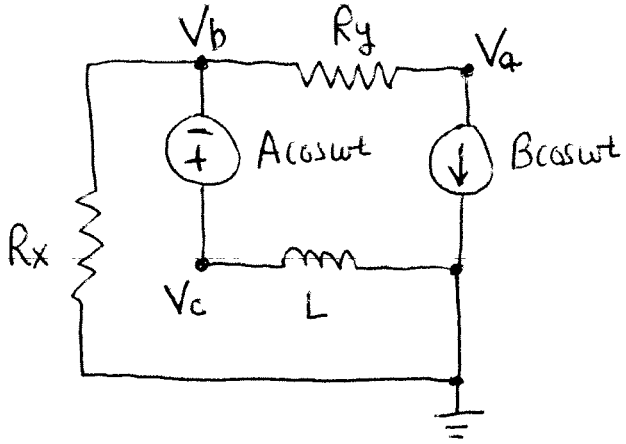
13. Determine the Thévenin (or equivalent) impedance seen by the two terminals for the given circuit in the frequency domain. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



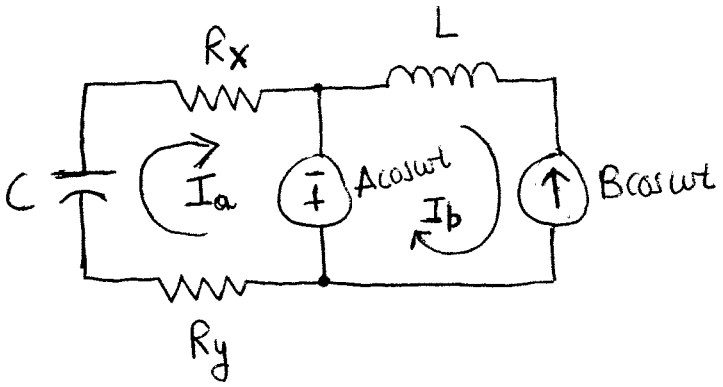
14. Using superposition, determine the current I in the frequency domain Do not simplify the expression. If needed, the symbol for two resistive elements in parallel (e.g., $R_s \| R_L$) may be used.



15. For the given circuit, using the labeled voltages, write all of the node voltage equations in the frequency domain as done in class. Do not simplify the expressions or solve for these voltages.



16. For the given circuit, using the labeled currents, write all of the mesh current equations in the frequency domain as done in class. Do not simplify the expressions or solve for these currents.



1 10. $\sqrt{3^2+8^2}\cos\left(\omega t + \tan^{-1}\frac{8}{3}\right)$ V

2 11. $\frac{-4}{\sqrt{2^2+15^2}}\cos\left(3t - \tan^{-1}\frac{15}{2}\right)$ A

2 12. $-8\angle 0^\circ \times \frac{R_y \,/\!/\, j\omega L}{(R_y \,/\!/\, j\omega L) + R_x}$ V $\quad \omega = 1$

1 13. $\left[(R_y \,/\!/\, j\omega L_2) + \frac{1}{j\omega C}\right] + j\omega L_1$ Ω

2 14. $A\angle 0^\circ \times \frac{R_y}{R_y + R_x + \frac{1}{j\omega C}} - \frac{B\angle 0^\circ}{R_x + \frac{1}{j\omega C} + R_y}$

$V_c - V_b = A\angle 0^\circ$

c a $\quad B\angle 0^\circ + \frac{V_a - V_b}{R_y} = 0$

c b $\quad \frac{V_b - V_a}{R_y} + \frac{V_c - 0}{j\omega L} + \frac{V_b - 0}{R_x} = 0$

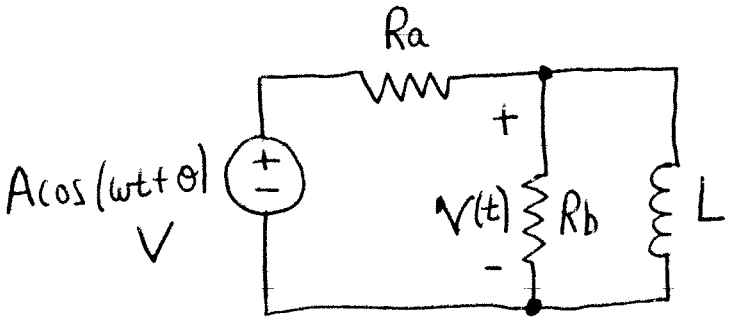
3 15.

$I_b = -B\angle 0^\circ$

$I_a \frac{1}{j\omega C} + I_a R_x - A\angle 0^\circ + I_a R_y = 0$

2 16.

4. Determine the voltage $v(t)$, in the time domain, for the following circuit. It is not necessary to evaluate the trigonometric functions, but no j's should be present in the final answer.

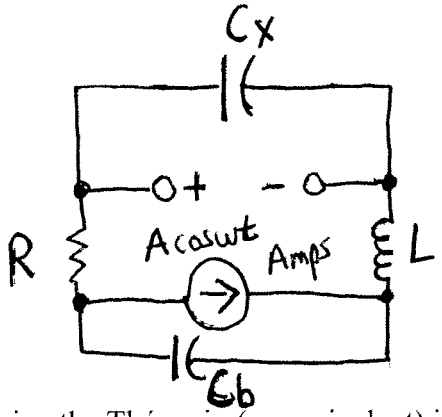


$$V = A\angle\theta^\circ \times \frac{R_b \| j\omega L}{R_a + R_b \| j\omega L}$$

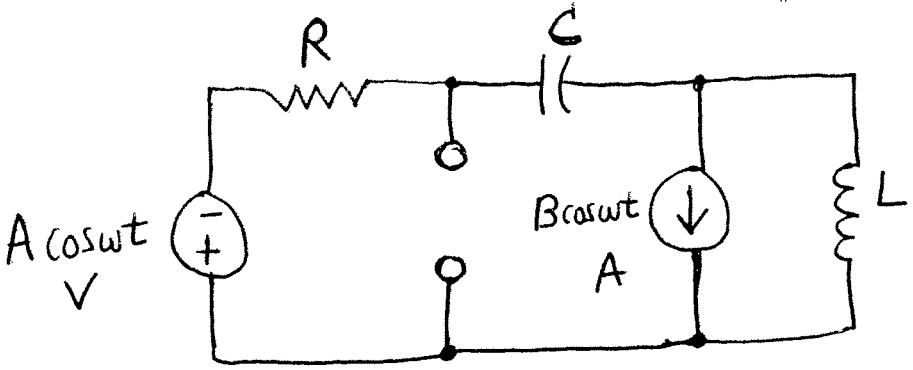
$$= A\angle\theta \; \frac{\frac{R_b j\omega L}{R_b + j\omega L}}{R_a + \frac{R_b j\omega L}{R_b + j\omega L}}$$

$$= A\angle\theta \; \frac{R_b j\omega L}{R_a R_b + j\omega L R_a + j\omega L R_b}$$

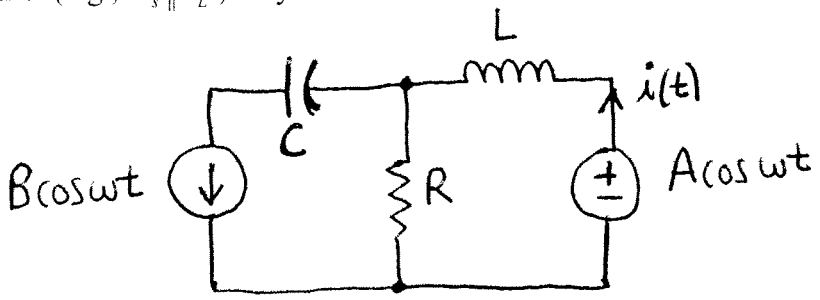
5. Determine the Thévenin voltage seen by the two terminals for the given circuit in the frequency domain using voltage division, current division, and/or Ohm's law. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



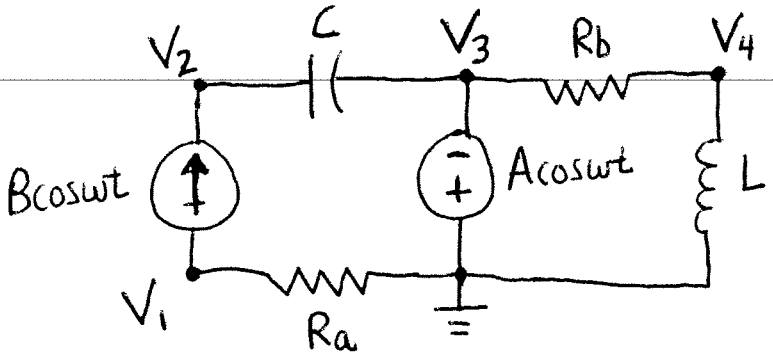
6. Determine the Thévenin (or equivalent) impedance seen by the two terminals for the given circuit in the frequency domain. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



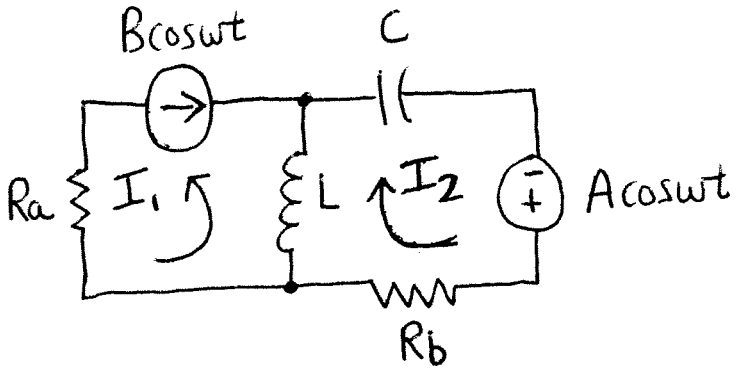
7. Using superposition, determine the current I in the frequency domain. Do not simplify the expression. If needed, the symbol for two resistive elements in parallel (e.g., $R_s \| R_L$) may be used.



8. For the given circuit, using the labeled voltages, write all of the node voltage equations in the frequency domain as done in class. Do not simplify the expressions or solve for these voltages.



9. For the given circuit, using the labeled currents, write all of the mesh current equations in the frequency domain as done in class. Do not simplify the expressions or solve for these currents.



Printed Name: SOLUTION

Signature: _____

34 total

Answer Sheet (Provide Units)

1 1. $L / [(R_b + R_c) // R_a]$ sec.

1 2(a) 0 V

1 2(b) $-V_s \times R_b/(R_a + R_b)$ V

1 2(c) $\tau = (R_b // R_a)C$ sec

1 2(d) $-V_s \frac{R_b}{R_a + R_b}\left(1 - e^{-t/\tau}\right)$ V

1 3(a) $-I_s \times \frac{R_a}{R_a + R_b}$ A

1 3(b) 0 A

1 3(c) $\tau = \frac{L}{R_c}$ sec

1 3(d) $-I_s \frac{R_a}{R_a + R_b} e^{-t/\tau}$ A

3 4. $v(t) = \frac{A\omega L R_b}{\sqrt{(R_a R_b)^2 + (\omega L R_a + \omega L R_b)^2}} \cos(\omega t + \theta + 90^\circ - \tan^{-1}\frac{\omega L(R_a + R_b)}{R_a R_b})$

2 5. $-A \times \frac{\frac{1}{j\omega C_b}}{\frac{1}{j\omega C_b} + R + j\omega L + \frac{1}{j\omega C_x}} \times \frac{1}{j\omega C_x}$

1 6. $\left(\frac{1}{j\omega C} + j\omega L\right) // R$

2 7. $\frac{A}{R+j\omega L} + B \times \frac{R}{R+j\omega L}$

$V_3 - 0 = -A$, $\frac{V_4-0}{j\omega L} + \frac{V_4-V_3}{R_b} = 0$

$\frac{V_2-V_3}{1/j\omega L} - B = 0$, $\frac{V_1-0}{R_a} + B = 0$

2 8.

$I_1 = -B$

1 9. $R_b I_2 + j\omega L (I_2 + I_1) + \frac{1}{j\omega C} I_2 - A = 0$

2 10. $S = \frac{j72}{5^2+8^2}$ VA

2 11. $\cos\left[\tan^{-1}\left(\frac{-1}{2}\right) - \tan^{-1}\left(\frac{-1}{5}\right)\right]$

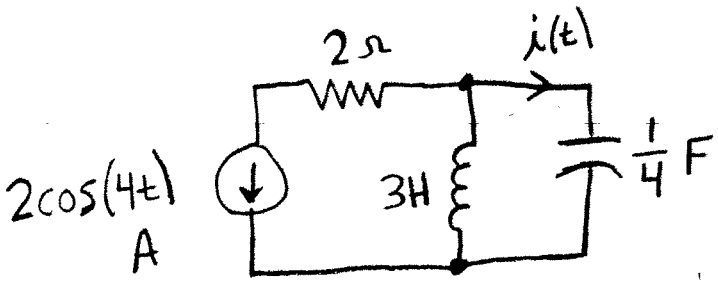
1 12. $4\sqrt{3}\angle -90°$ Vrms

1 13. BPF

1 14. $\frac{R_b \| \frac{1}{j\omega C}}{(R_b \| \frac{1}{j\omega C}) + R_a + j\omega L}$

10. Assuming a frequency of ω rad/s, convert the phasor voltage $-3+j4$ V to the time domain.

11. Determine the current $i(t)$, in the time domain, for the following circuit. It is not necessary to evaluate the trigonometric functions, but no j's should be present in the final answer.



$$I = -2\angle 0^\circ \times \frac{j12}{j12 + \frac{1}{j}}$$

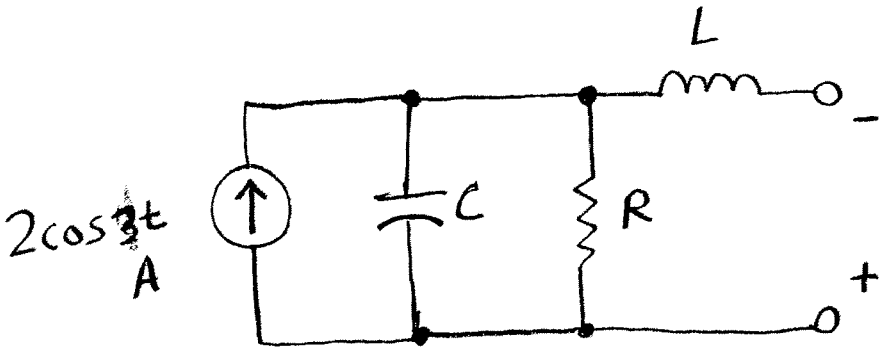
$$= -2\angle 0^\circ \frac{j12}{j11}$$

$$= -2\angle 0^\circ \frac{12}{11}$$

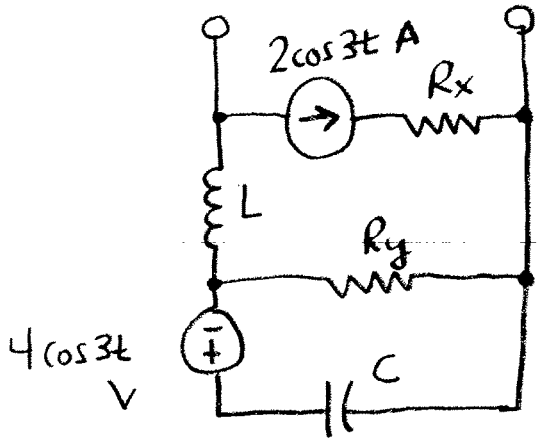
$$j\omega L = j4 \cdot 3$$

$$\frac{1}{j\omega C} = \frac{1}{j\frac{1}{4}} = \frac{1}{j} = -j$$

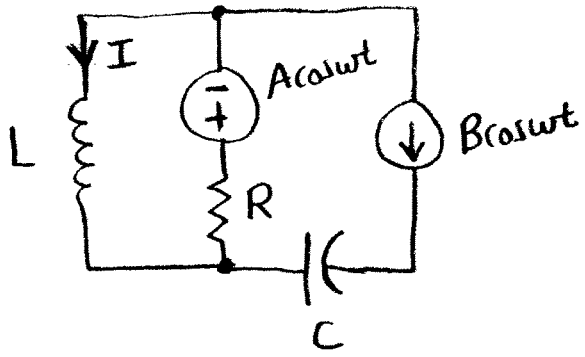
12. Determine the Thévenin voltage seen by the two terminals for the given circuit in the frequency domain using voltage division, current division, and/or Ohm's law. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



13. Determine the Thévenin (or equivalent) impedance seen by the two terminals for the given circuit in the frequency domain. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



14. Using superposition, determine the current I in the frequency domain Do not simplify the expression. If needed, the symbol for two resistive elements in parallel (e.g., $R_s \| R_L$) may be used.



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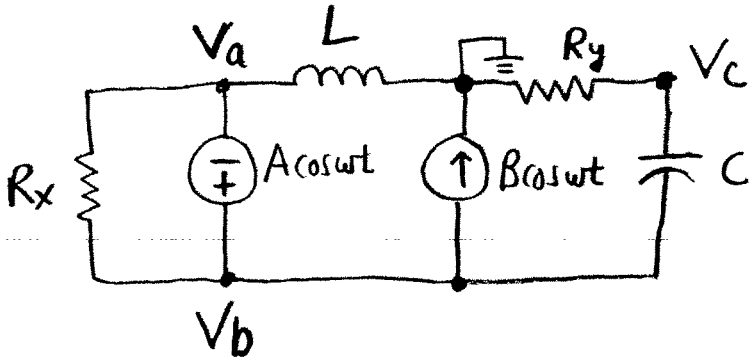
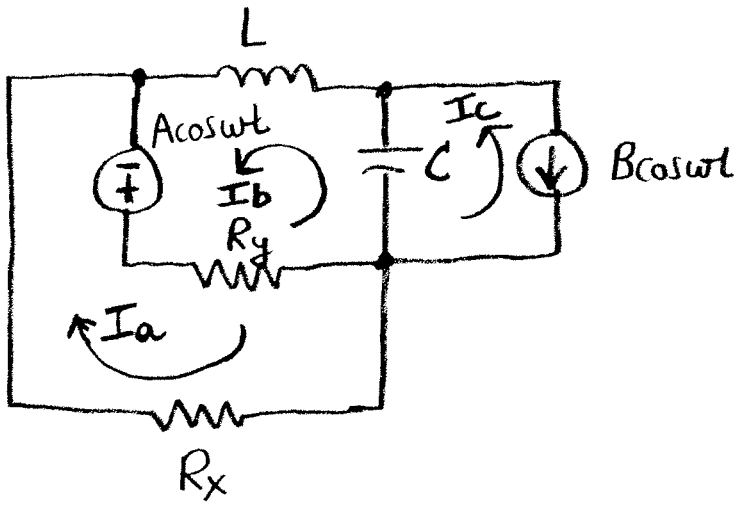


16. For the given circuit, using the labeled currents, write all of the mesh current equations in the frequency domain as done in class. Do not simplify the expressions or solve for these currents.



1 10. $\sqrt{3^2+4^2}\cos(\omega t + \tan^{-1}\frac{4}{-3})$ V

3 11. $\frac{-2\cdot 12}{11}\cos(4t)$ A

2 12. $-2\angle 0^\circ \left(R \| \frac{1}{j\omega C}\right)$ V

2 13. $\left[\left(\frac{1}{j\omega C} \| R_4\right) + j\omega L\right]$ Ω $\omega = 3$ rad/s

4 14. $-\frac{A\angle 0^\circ}{R+j\omega L} - B\angle 0^\circ \times \frac{R}{R+j\omega L}$

(1) $V_b - V_a = A\angle 0^\circ$

(2) $\frac{V_c - V_b}{\frac{1}{j\omega C}} + \frac{V_c - 0}{R_y} = 0$

(3) $B\angle 0^\circ + \frac{V_b - V_c}{\frac{1}{j\omega C}} + \frac{V_a - 0}{j\omega L} = 0$

3 15.

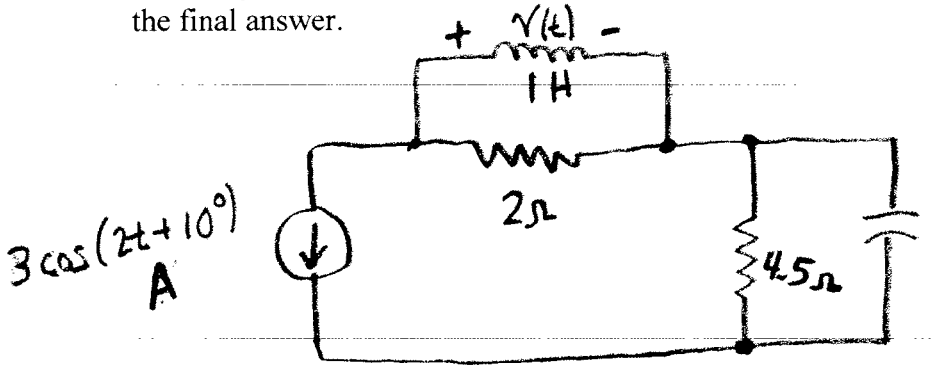
(1) $I_c = -B\angle 0^\circ$

(2) $j\omega L I_b - A\angle 0^\circ + R_y(I_b + I_a) + \frac{1}{j\omega C}(I_b - I_c) = 0$

(3) $R_x I_a + j\omega L(-I_b) + \frac{1}{j\omega C}(I_c - I_b) = 0$

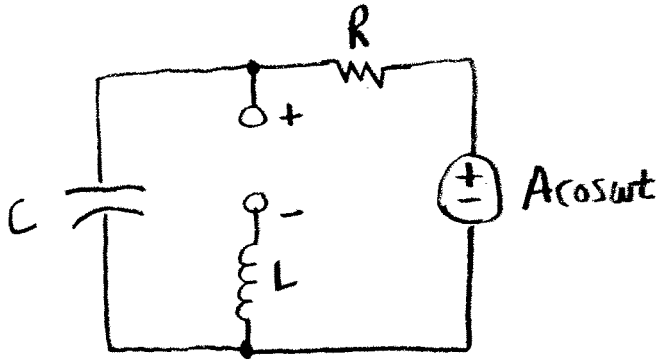
3 16.

4. Determine the voltage $v(t)$, in the time domain, for the following circuit. It is not necessary to evaluate the trigonometric functions, but no j's should be present in the final answer.

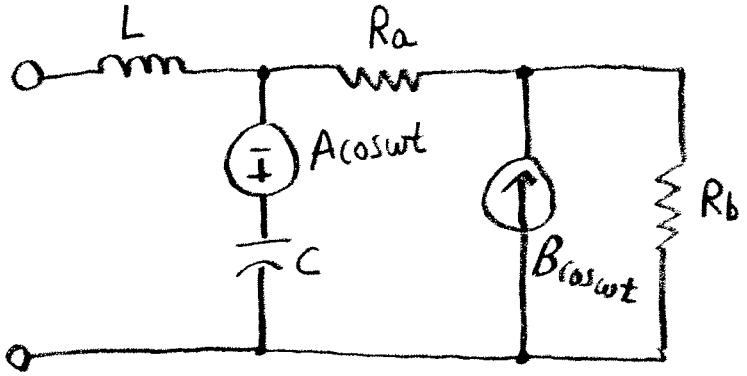


$$V_s = -3\angle 10^\circ \times 2 \| j2$$
$$= -3\angle 10^\circ \times \frac{4j}{2+2j}$$
$$= -12\angle 100^\circ / 8\angle 45^\circ$$

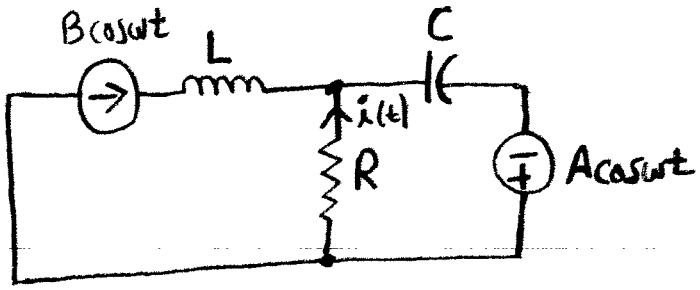
5. Determine the Thévenin voltage seen by the two terminals for the given circuit in the frequency domain using voltage division, current division, and/or Ohm's law. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



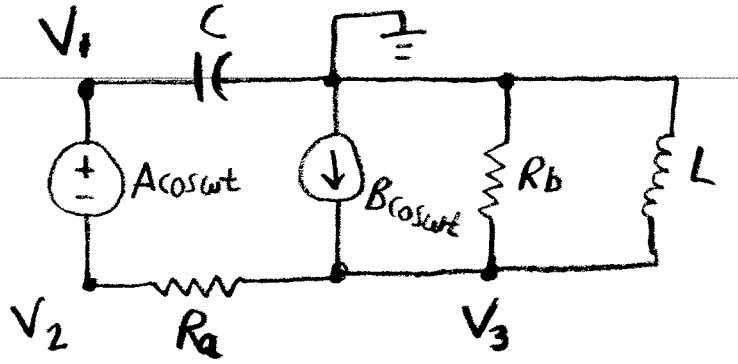
6. Determine the Thévenin (or equivalent) impedance seen by the two terminals for the given circuit in the frequency domain. Do not simplify the expression. If needed, the symbol for two elements in parallel (e.g., $R_s \| R_L$) may be used.



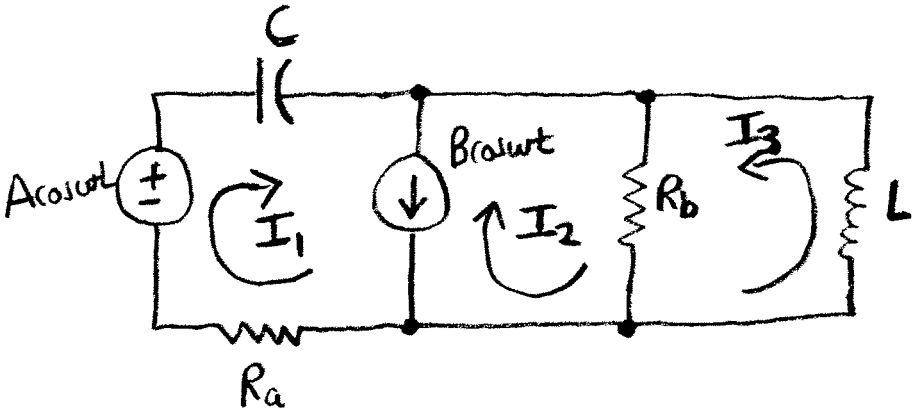
7. Using superposition, determine the current I in the frequency domain. Do not simplify the expression. If needed, the symbol for two resistive elements in parallel (e.g., $R_s \| R_L$) may be used.



8. For the given circuit, using the labeled voltages, write all of the node voltage equations in the frequency domain as done in class. Do not simplify the expressions or solve for these voltages.



9. For the given circuit, using the labeled currents, write all of the mesh current equations in the frequency domain as done in class. Do not simplify the expressions or solve for these currents.



50 pts total

Printed Name: SOLUTION

Signature:

Answer Sheet (Provide Units)

1 1. $C((R_b + R_c) \| R_a)$ sec.

1 2(a) $-I_s \frac{R_a}{R_a+R_b+R_c} R_c$ V

1 2(b) 0 V

1 2(c) $C(R_b \| R_c)$ sec

1 2(d) $-I_s \frac{R_a}{R_a+R_b+R_c} R_c e^{-t/\tau}$ V

1 3(a) $\frac{V_s}{R_a \| R_b}$ A

1 3(b) $V_s / ((R_b + R_c) \| R_a)$

1 3(c) $L / (R_b + R_c) \| R_a$ sec

1 3(d) $\frac{V_s}{(R_b+R_c) \| R_a} + \left(\frac{V_s}{R_a \| R_b} - \frac{V_s}{(R_b+R_c) \| R_a} \right) e^{-t/\tau}$

4 4. $\frac{-12}{\sqrt{8}} \cos(2t + 100 - 45^\circ)$, $\frac{12}{\sqrt{8}} \cos(2t + 55^\circ + 180^\circ)$ V

($\sqrt{8} = 2\sqrt{2}$; 55°; 235°)

2 5. $A\angle 0^\circ \times \frac{1/j\omega C}{1/j\omega C + R}$ V

2 6. $\left[(R_b + R_a) \| \frac{1}{j\omega C}\right] + j\omega L$

4 7. $-B\angle 0^\circ \times \frac{\frac{1}{j\omega C}}{R+\frac{1}{j\omega C}} + \frac{A\angle 0^\circ}{R+\frac{1}{j\omega C}}$

(1) $V_1 - V_2 = A\angle 0^\circ$ (3) $\frac{V_2 - V_3}{R_a} + \frac{V_1 - 0}{\frac{1}{j\omega C}} = 0$

(2) $\frac{V_3 - 0}{j\omega L} + \frac{V_3 - 0}{R_b} - B\angle 0^\circ + \frac{V_3 - V_2}{R_a} = 0$

3 8.

(1) $R_a I_1 - A\angle 0^\circ + I_1 \frac{1}{j\omega C} + (I_2 + I_3) R_b = 0$

OR $- I_3 j\omega L$

(2) $I_1 - I_2 = B\angle 0^\circ$

3 9. (3) $I_3 j\omega L + (I_2 + I_3) R_b = 0$

4 10. $\frac{256}{\sqrt{32}}\angle 45^\circ = \frac{256}{\sqrt{32}}\left(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)$ VA, $\cos 45^\circ = \frac{1}{\sqrt{2}}$, $\sin 45^\circ = \frac{1}{\sqrt{2}}$

$\sqrt{32}\sqrt{2} = \sqrt{16 \cdot 2}\sqrt{2} = 4 \cdot 2 = 8$

3 11. $\cos\left(\tan^{-1}\frac{-12/11}{7}\right)$

2 12. $2\sqrt{3}\angle 90^\circ$ V

1 13. LPF

2 14. $\frac{j\omega L_2}{j\omega L_2 + (R \,//\, \frac{1}{j\omega C})}$