

# ECE 210/211 HWs HW 1

Student ZRZ7 AWL6

TOTAL POINTS

**69.5 / 75**

QUESTION 1

1 0 / 0

✓ - 0 pts Correct

✓ - 0 pts Correct

QUESTION 2

2 5 / 5

✓ - 0 pts Correct

QUESTION 7

6 pts

7.1 2 / 2

✓ - 0 pts Correct

QUESTION 3

25 pts

3.1 5 / 5

✓ - 0 pts Correct

7.2 2 / 2

✓ - 0 pts Correct

3.2 5 / 5

✓ - 0 pts Correct

QUESTION 8

6 pts

3.3 5 / 5

✓ - 0 pts Correct

8.1 2 / 2

✓ - 0 pts Correct

3.4 5 / 5

✓ - 0 pts Correct

8.2 2 / 2

✓ - 0 pts Correct

3.5 2.5 / 5

✓ - 2.5 pts Missing/incorrect loop label

8.3 1 / 2

✓ - 1 pts Minor Error (sign, coefficient, answer not simplified...)

QUESTION 4

4 10 / 10

✓ - 0 pts Correct (\$\$I\_5 = -1 \text{ text[A]}, V\_5 = -6 \text{ V}\$\$)

QUESTION 9

8 pts

QUESTION 5

5 10 / 10

✓ - 0 pts Correct

9.1 2 / 2

✓ - 0 pts Correct

QUESTION 6

6 5 / 5

9.2 2 / 2

✓ - 0 pts Correct

9.3 2 / 2

✓ - 0 pts Correct

9.4 0 / 2

✓ - 2 pts inCorrect

01/23/2022

1. Varanya Jain

2.



$$R_t = 24 \text{ k}\Omega$$

$$R_s = R_1 + R_2$$

$$R_p = \frac{R_1 R_2}{R_1 + R_2}$$

$$\text{Circuit diagram showing } R_s = R_1 + R_2 = R_3 + R_4 = R_p$$

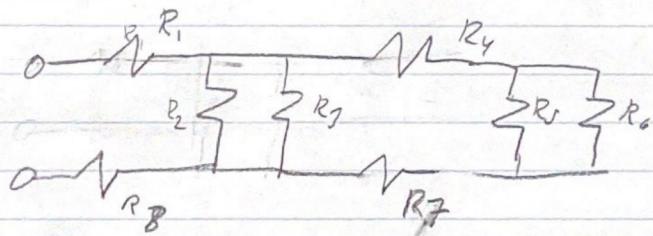
$$12 + 24 + 24 = 60$$

$$\left( \frac{60 \cdot 24}{60 + 24} \right) = 17.142$$

$$\left( \frac{17.142 \cdot 24}{17.142 + 24} \right) = 10$$

$$10 \text{ k}\Omega$$

$$10 + 24 + 24 = 58 \text{ k}\Omega$$



$$R_T = \frac{R_5 R_6 + R_4 + R_7}{R_5 + R_6} = R_{4567}$$

$$\left[ \left( \frac{1}{R_{4567}} \right) + \frac{1}{R_2} + \frac{1}{R_3} \right]^{-1} = R_{234567}$$

$$R_T = R_1 + R_8 + R_{234567} \rightarrow R_T = 58 \text{ k}\Omega$$

1 0 / 0

✓ - 0 pts Correct

01/23/2022

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$$R_t = 24 \text{ k}\Omega$$

$$R_s = R_1 + R_2$$

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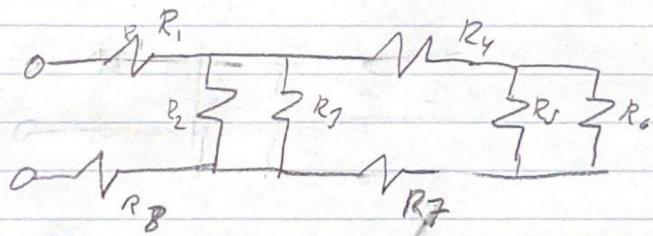
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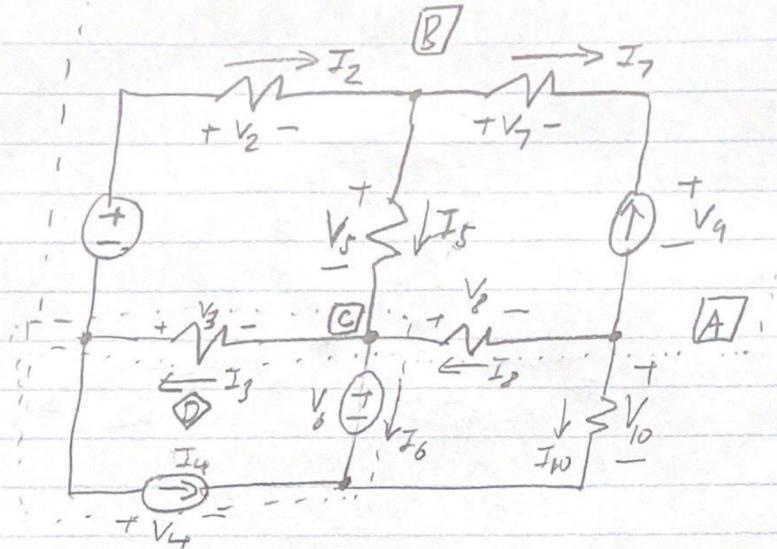
$$\left[ \left( \frac{1}{R_{4567}} \right) + \frac{1}{R_2} + \frac{1}{R_3} \right]^{-1} = R_{234567}$$

$$R_T = R_1 + R_8 + R_{234567} \rightarrow R_T = 58 \text{ k}\Omega$$

2 5 / 5

✓ - 0 pts Correct

3.

**KCL**

$$a) \quad I_8 + I_9 + I_{10} = 0$$

The given "C" is wrong  
because KCL states

**KCL**

$$b) \quad I_2 = I_5 + I_7$$

current into a node

**KCL**

$$c) \quad I_5 + I_8 = I_2 + I_6$$

must equal the current  
out, and the provided  
equation mixes terms on  
both sides of the equal sign

**KVL**

$$d) \quad V_4 - V_3 - V_6 = 0$$

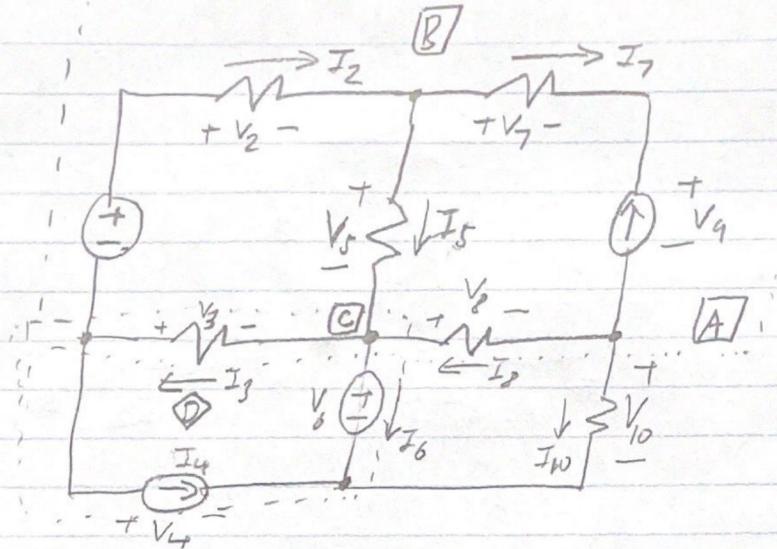
**KVL**

$$e) \quad V_1 + V_8 + V_3 = V_2 + V_7 + V_5$$

3.1 5 / 5

✓ - 0 pts Correct

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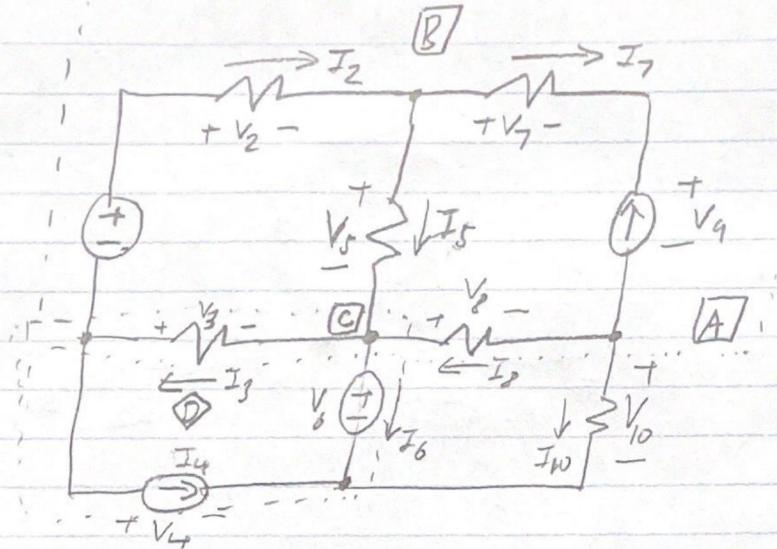
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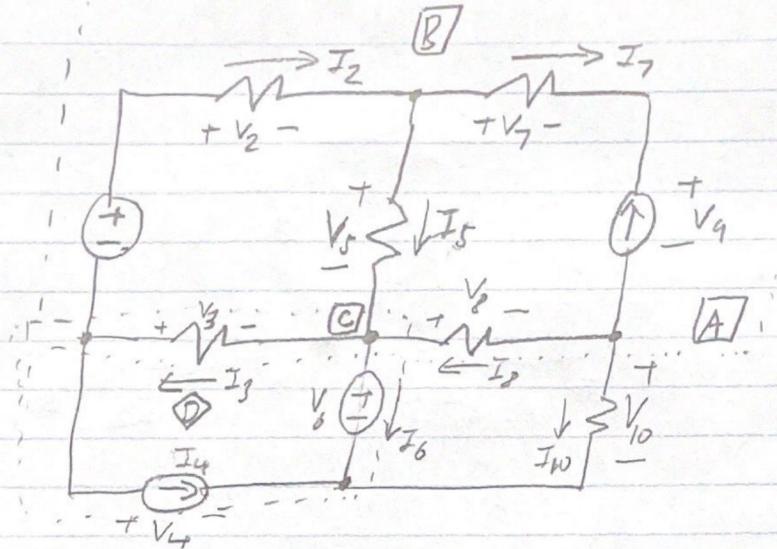
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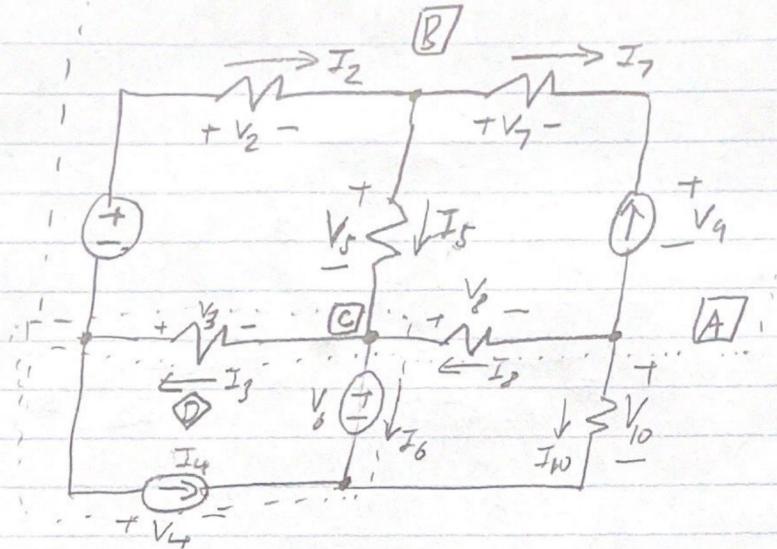
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✓ - 0 pts Correct

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**KVL**

$$d) V_4 - V_3 - V_6 = 0$$

**KVL**

$$e) V_1 + V_8 + V_3 = V_2 + V_7 + V_5$$

3.5 2.5 / 5

✓ - **2.5 pts** Missing/incorrect loop label

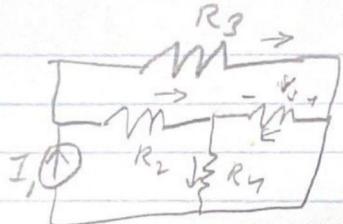
FIVE STAR  
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FIVE STAR  
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FIVE STAR  
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FIVE STAR  
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4.



$$I_1 = 3.6A, R_2 = 1.2, R_3 = 5\Omega, R_4 = R_5 = 6\Omega$$

$$\textcircled{1} \text{ KCL: } 3.6 = \frac{V_2}{6} + \frac{V_3}{1}$$

$$\textcircled{2} \text{ } (2.6)(5) = V_3 + 5V_2 \rightarrow 18 = V_3 + 5V_2$$

$$\textcircled{3} \text{ } -V_5 + V_2 - V_3 = 0$$

$$\textcircled{4} \text{ KCL: } \frac{V_2}{1} + \frac{V_3}{6} = \frac{V_4}{6}$$

$$\textcircled{5} \text{ } 6V_2 + V_4 = V_4 \rightarrow V_4 + V_5 = 0 \rightarrow \frac{V_4}{6} = -V_5 \quad \textcircled{6}$$

$$\textcircled{7} \text{ } 6V_2 + V_5 = V_4 \rightarrow 6V_2 = V_4 - V_5 \rightarrow 6V_2 = 2V_4 \rightarrow \frac{V_4}{6} = \frac{V_2}{2} \quad \textcircled{8}$$

$$\textcircled{9} \text{ } V_3 + V_5 - V_2 = 0 \rightarrow \textcircled{10} \text{ } V_3 + (6V_2) - V_2 = 0, \quad V_3 = V_4 + V_5 \rightarrow V_3 = 4V_2 \quad \textcircled{11}$$

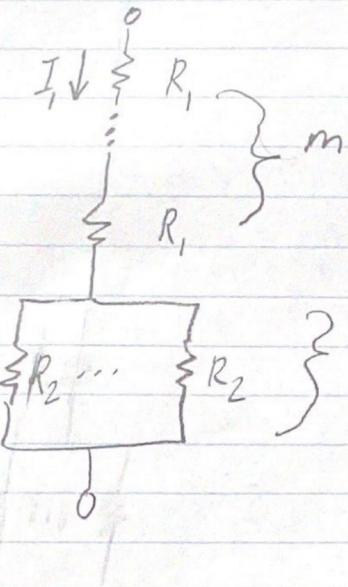
$$\textcircled{12} \text{ } 18 = V_3 + 5V_2 \rightarrow \textcircled{13} \text{ } 18 = (4V_2) + 5V_2 \rightarrow 18 = 9V_2 \rightarrow \textcircled{14} \text{ } V_2 = 2V \rightarrow \textcircled{15} \text{ } V_4 = 6V$$

$$\textcircled{16} \text{ } 6V_2 + V_5 = V_4 \rightarrow 6(2V) + V_5 = (6V), \quad \boxed{\begin{array}{l} V_5 = -6V \\ I_s = -A \end{array}}$$

4 10 / 10

✓ - 0 pts Correct (\$\$I\\_5 = -1 \text{ text}{A}, V\\_5 = -6 V\$\$

5.



$m = 15$  resistors of value  $R_1 = 80\Omega$   
connected to "II" comb of  $n = 4$  resistors of  
value  $R_2 = 720\Omega$

All resistors are individually rated  
at  $\frac{1}{4}W$

$$R_T = (m)R_1 + \left(\frac{n}{R_2}\right)^{-1}$$

$$R_T = (15 \cdot 80) + \left(\frac{4}{720}\right)^{-1} = 1200 + 180\Omega$$

$$R_T = 1380\Omega, P = \frac{1}{4}W$$

$$R_p = 180\Omega$$

$$R_s = 1200\Omega$$

$$P = IV = I^2R, I = \sqrt{\frac{P}{R}}$$

$$\frac{1}{4} = (I_s)^2(R_1), I_s = 0.0589016994A$$

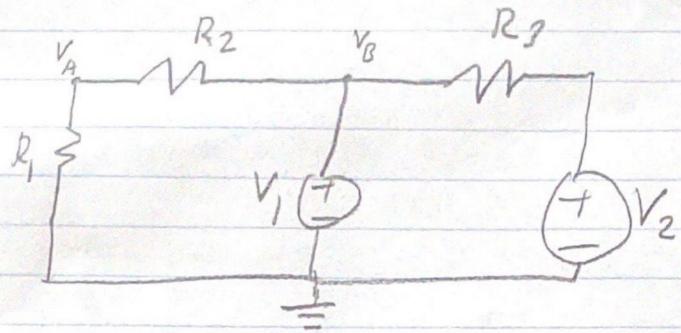
$$\frac{1}{4} = (I_p)^2(R_2), I_p = 0.0186338998125A$$

$$I_s < I_p \rightarrow I_1 = I_s \approx 0.056A$$

5 10 / 10

✓ - 0 pts Correct

6.



$$V_A = ?$$

$$V_1 = 4V$$

$$V_2 = 3V$$

~~$$R_1 = 30\Omega$$~~

$$R_2 = 10\Omega$$

$$R_3 = 10\Omega$$

$$V_B = I_1 R_1 + I_2 R_2 \rightarrow 4V = I_{12} (40\Omega), I_{12} = \frac{1}{10}A$$

$$V_A = (I_{12})(R_1) = \left(\frac{1}{10}A\right)(30\Omega) = \boxed{3V = V_A}$$

$$V_1 - V_2 = I_2 R_3, 4 - 3 = I_2 (10\Omega), I_2 = \frac{1}{10}A \rightarrow V_2 = 1V \quad |(R_3)$$

$$I_{12} = \frac{1}{10}A \rightarrow V_2 = 1V \quad |(R_2)$$

$$I_{12} = \frac{1}{10}A \rightarrow V_1 = 3V \quad |(R_1)$$

6 5 / 5

✓ - 0 pts Correct

$$ae^{j\theta} = a(\cos \theta + j \sin \theta)$$

$$ae^{-j\theta} = a(\cos \theta - j \sin \theta)$$

7. a)  $A = e^{j\frac{\pi}{4}}$  rectangular phasor?
- b)  $B = e^{-j\frac{3\pi}{4}}$
- c)  $C = 9e^{-j\frac{\pi}{6}}$

$$\hookrightarrow a \rightarrow e^{j225^\circ} = \cos(225) + j \sin(225) = \boxed{-\frac{\sqrt{2}}{2} - j \frac{\sqrt{2}}{2}}$$

$$\hookrightarrow b \rightarrow e^{-j\frac{3\pi}{4}} = \cos(-\frac{3\pi}{4}) + j \sin(-\frac{3\pi}{4}) = \boxed{-\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}j}$$

$$\hookrightarrow c \rightarrow 9e^{-j\frac{\pi}{6}} \rightarrow 9(\cos(-\frac{\pi}{6}) - j \sin(-\frac{\pi}{6})) = \boxed{9(\frac{\sqrt{3}}{2} - \frac{1}{2}j)}$$

8. complex  $\rightarrow$  exponential

a)  $D = -\sqrt{2} - j\sqrt{2} \rightarrow -2(\frac{\sqrt{2}}{2} + j\frac{\sqrt{2}}{2})$

b)  $E = \sqrt{3} - j$

c)  $F = 3 - j^4 \quad \boxed{D = -2e^{j\frac{3\pi}{4}}}$

$$\hookrightarrow b \rightarrow -2(\frac{\sqrt{3}}{2} - \frac{1}{2}) = \boxed{2e^{-j\frac{\pi}{6}} = E}$$

$$\hookrightarrow c \rightarrow \sqrt{3+4^2} = 5 = r \rightarrow \boxed{5e^{-j\tan^{-1}(4/3)}} = F$$

9.  $A = e^{j\frac{5\pi}{4}}, B = e^{-j\frac{3\pi}{4}} \rightarrow$  exponential

a)  $P = AB$

b)  $Q = AB^*$

c)  $R = A^*B$

d)  $S = A + B$

$\omega \frac{e^{j\frac{5\pi}{4}}}{e^{-j\frac{3\pi}{4}}} = e^{j\frac{8\pi}{2}} = \boxed{j}$

b)  $P^* = e^{j\frac{5\pi}{4}} \rightarrow AB^* = e^{j\frac{5\pi}{4}} e^{-j\frac{3\pi}{4}} = e^{j\frac{2\pi}{4}} = e^{j\frac{\pi}{2}} = \boxed{1}$

c)  $R = e^{j\frac{5\pi}{4}} e^{j\frac{3\pi}{4}} = e^{j2\pi} = \boxed{1}$

d)  $A \rightarrow -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}j \rightarrow -\sqrt{2} - j\sqrt{2} \rightarrow \boxed{-2e^{j\frac{5\pi}{4}}}$

7.1 2 / 2

✓ - 0 pts Correct

$$ae^{j\theta} = a(\cos \theta + j \sin \theta)$$

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a)  $D = -\sqrt{2} - j\sqrt{2} \rightarrow -2\left(\frac{\sqrt{2}}{2} + j\frac{\sqrt{2}}{2}\right)$

b)  $E = \sqrt{3} - j$

c)  $F = 3 - j^4 \quad \boxed{D = -2e^{j\frac{3\pi}{4}}}$

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d)  $A \rightarrow -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}j \rightarrow -\sqrt{2} - j\sqrt{2} \rightarrow \boxed{-2e^{j\frac{5\pi}{4}}}$

7.2 2 / 2

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$$\hookrightarrow c \rightarrow 9e^{-j\frac{\pi}{6}} \rightarrow 9\left(\cos\left(-\frac{\pi}{6}\right) - j \sin\left(-\frac{\pi}{6}\right)\right) = \boxed{9\left(\frac{\sqrt{3}}{2} - \frac{1}{2}j\right)}$$

8. complex  $\rightarrow$  exponential

a)  $D = -\sqrt{2} - j\sqrt{2} \rightarrow -2\left(\frac{\sqrt{2}}{2} + j\frac{\sqrt{2}}{2}\right)$

b)  $E = \sqrt{3} - j$

c)  $F = 3 - j^4 \quad \boxed{D = -2e^{j\frac{3\pi}{4}}}$

$$\hookrightarrow b \rightarrow -2\left(\frac{\sqrt{3}}{2} - \frac{1}{2}j\right) = \boxed{2e^{-j\frac{\pi}{6}} = E}$$

$$\hookrightarrow c \rightarrow \sqrt{3+4^2} = 5 = r \rightarrow \boxed{5e^{-j\tan^{-1}(4/3)}} = F$$

9.  $A = e^{j\frac{5\pi}{4}}, B = e^{-j\frac{3\pi}{4}} \rightarrow$  exponential

a)  $P = AB$

b)  $Q = AB^*$

c)  $R = A^*B$

d)  $S = A + B$

$\omega \frac{e^{j\frac{5\pi}{4}}}{e^{-j\frac{3\pi}{4}}} = e^{j\frac{8\pi}{2}} = \boxed{j}$

b)  $P^* = e^{j\frac{5\pi}{4}} \rightarrow AB^* = e^{j\frac{5\pi}{4}} e^{-j\frac{3\pi}{4}} = e^{j\frac{2\pi}{4}} = e^{j\frac{\pi}{2}} = \boxed{1}$

c)  $R = e^{j\frac{5\pi}{4}} e^{-j\frac{3\pi}{4}} = e^{j2\pi} = \boxed{1}$

d)  $A \rightarrow -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}j \rightarrow -\sqrt{2} - j\sqrt{2} \rightarrow \boxed{-2e^{j\frac{5\pi}{4}}}$

8.2 2 / 2

✓ - 0 pts Correct

$$ae^{j\theta} = a(\cos \theta + j \sin \theta)$$

$$ae^{-j\theta} = a(\cos \theta - j \sin \theta)$$

7. a)  $A = e^{j\frac{\pi}{4}}$  rectangular phasor?
- b)  $B = e^{-j\frac{3\pi}{4}}$
- c)  $C = 9e^{-j\frac{\pi}{6}}$

$$\hookrightarrow a \rightarrow e^{j225^\circ} = \cos(225) + j \sin(225) = \boxed{-\frac{\sqrt{2}}{2} - j \frac{\sqrt{2}}{2}}$$

$$\hookrightarrow b \rightarrow e^{-j\frac{3\pi}{4}} = \cos(-\frac{3\pi}{4}) + j \sin(-\frac{3\pi}{4}) = \boxed{-\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}j}$$

$$\hookrightarrow c \rightarrow 9e^{-j\frac{\pi}{6}} \rightarrow 9(\cos(-\frac{\pi}{6}) - j \sin(-\frac{\pi}{6})) = \boxed{9(\frac{\sqrt{3}}{2} - \frac{1}{2}j)}$$

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a)  $D = -\sqrt{2} - j\sqrt{2} \rightarrow -2(\frac{\sqrt{2}}{2} + j\frac{\sqrt{2}}{2})$

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8.3 1 / 2

✓ - 1 pts Minor Error (sign, coefficient, answer not simplified...)

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a)  $D = -\sqrt{2} - j\sqrt{2} \rightarrow -2\left(\frac{\sqrt{2}}{2} + j\frac{\sqrt{2}}{2}\right)$

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9.1 2 / 2

✓ - 0 pts Correct

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d)  $A \rightarrow -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}j \rightarrow -\sqrt{2} - j\sqrt{2} \rightarrow \boxed{-2e^{j\frac{5\pi}{4}}}$

9.2 2 / 2

✓ - 0 pts Correct

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9.3 2 / 2

✓ - 0 pts Correct

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$$ae^{-j\theta} = a(\cos \theta - j \sin \theta)$$

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9.4 0 / 2

✓ - 2 pts inCorrect