

ECE 210/211 HWs HW 1

Student ZRZ7 AWL6

TOTAL POINTS

69.5 / 75

QUESTION 1

1 0 / 0

✓ - 0 pts Correct

QUESTION 2

2 5 / 5

✓ - 0 pts Correct

QUESTION 3

25 pts

3.1 5 / 5

✓ - 0 pts Correct

3.2 5 / 5

✓ - 0 pts Correct

3.3 5 / 5

✓ - 0 pts Correct

3.4 5 / 5

✓ - 0 pts Correct

3.5 2.5 / 5

✓ - 2.5 pts Missing/incorrect loop label

QUESTION 4

4 10 / 10

✓ - 0 pts Correct ($I_5 = -1 \text{ A}$, $V_5 = -6 \text{ V}$)

QUESTION 5

5 10 / 10

✓ - 0 pts Correct

QUESTION 6

6 5 / 5

✓ - 0 pts Correct

QUESTION 7

6 pts

7.1 2 / 2

✓ - 0 pts Correct

7.2 2 / 2

✓ - 0 pts Correct

7.3 2 / 2

✓ - 0 pts Correct

QUESTION 8

6 pts

8.1 2 / 2

✓ - 0 pts Correct

8.2 2 / 2

✓ - 0 pts Correct

8.3 1 / 2

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

QUESTION 9

8 pts

9.1 2 / 2

✓ - 0 pts Correct

9.2 2 / 2

✓ - 0 pts Correct

9.3 2 / 2

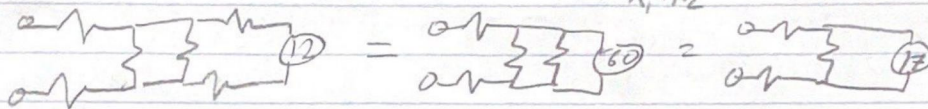
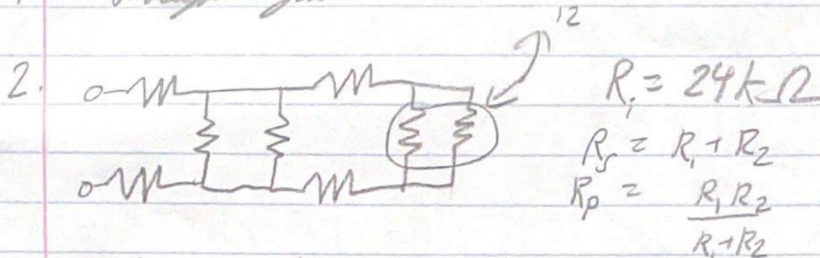
✓ - 0 pts Correct

9.4 0 / 2

✓ - 2 pts inCorrect

01/23/2022

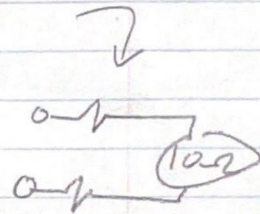
1. Voltage Divider



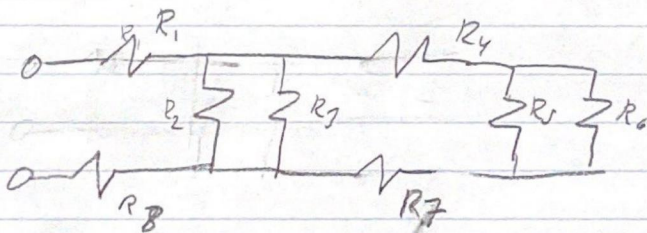
$$12 + 24 + 24 = 60$$

$$\left(\frac{60 \cdot 24}{80 + 24} \right) = 17.142$$

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



$$10 + 24 + 24 = 58k\Omega$$



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

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

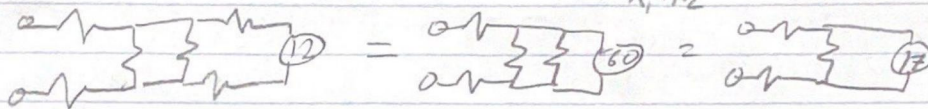
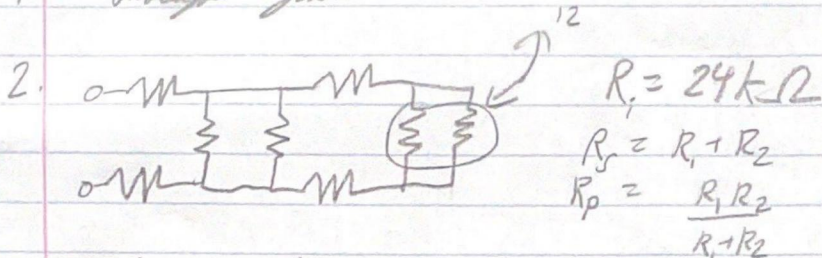
$$R_T = R_1 + R_8 + R_{234567} \rightarrow R_T = 58k\Omega$$

1 0 / 0

✓ - 0 pts Correct

01/23/2022

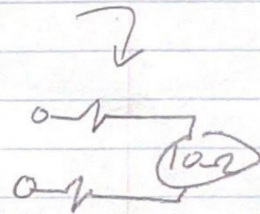
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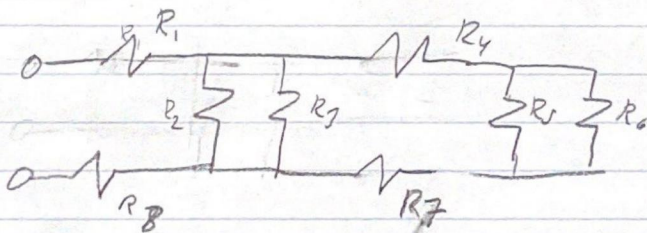
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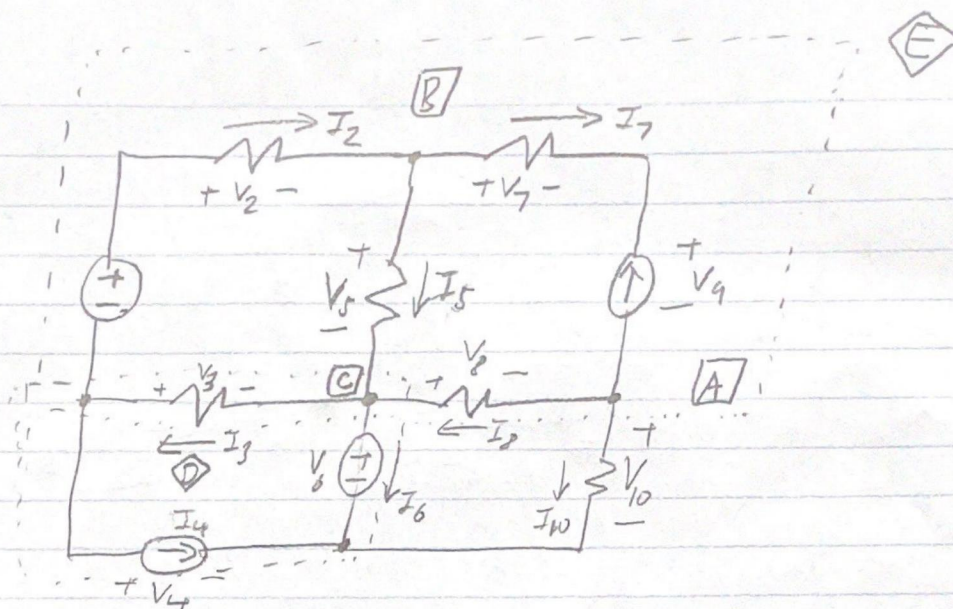
$$\left[\left(\frac{1}{R_{4567}} \right) + \frac{1}{R_2} + \frac{1}{R_3} \right]^{-1} = R_{234567}$$

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

2 5 / 5

✓ - 0 pts Correct

3.



KCL

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

The given "c" is wrong because KCL states current into a node

KCL

b) $I_2 = I_5 + I_7$

must equal the current out, and the provided

KCL

c) $I_5 + I_8 = I_3 + I_6$

equation mixes terms on both sides of the equal sign

KVL

d) $V_4 - V_3 - V_6 = 0$

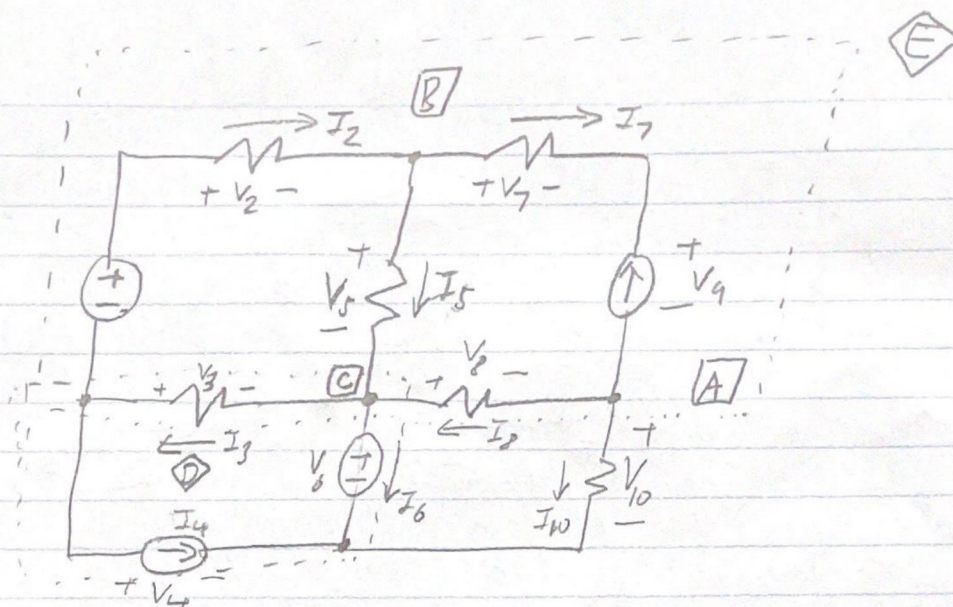
KVL

e) $V_1 + V_8 + V_3 = V_2 + V_7 + V_9$

3.1 5 / 5

✓ - 0 pts Correct

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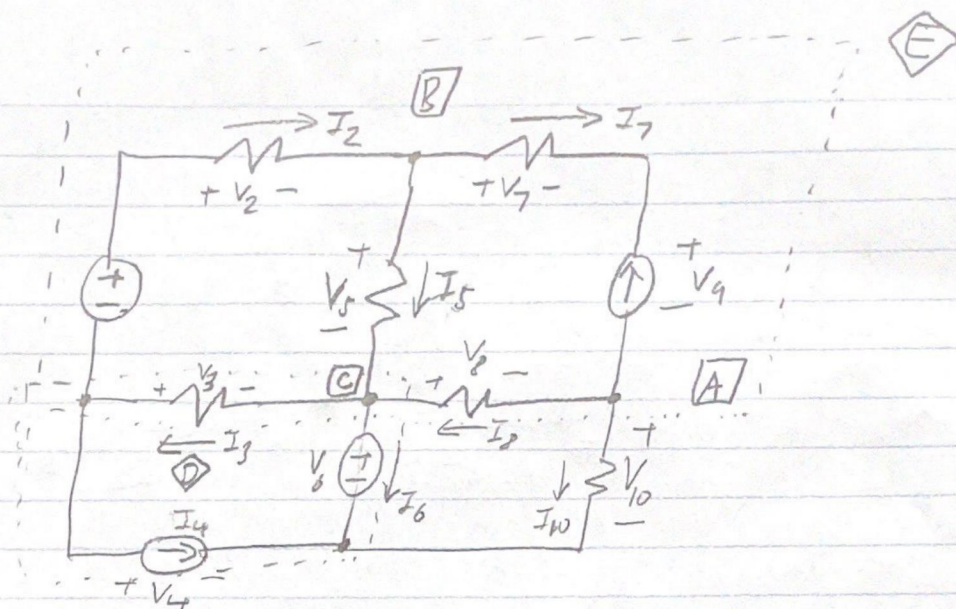
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3.2 5 / 5

✓ - 0 pts Correct

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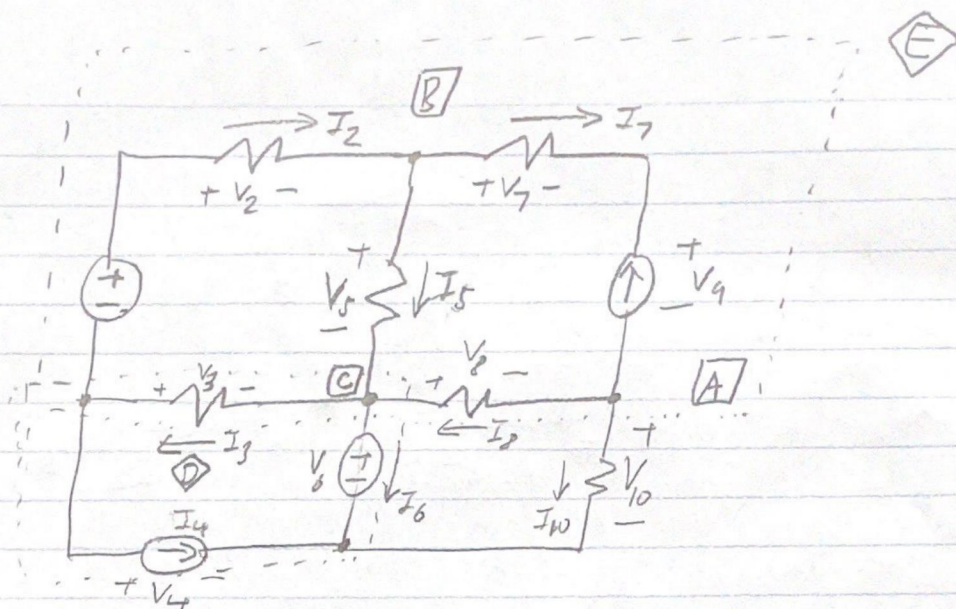
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3.3 5 / 5

✓ - 0 pts Correct

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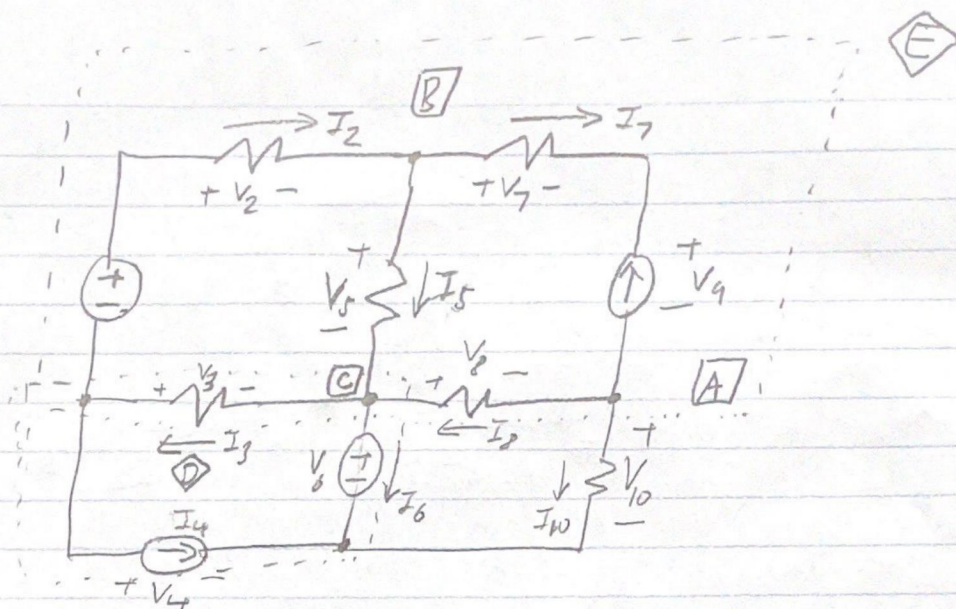
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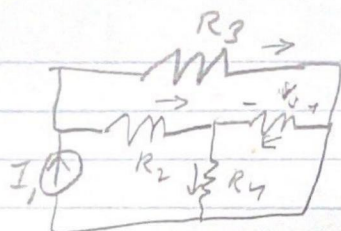
KVL

e) $V_1 + V_8 + V_3 = V_2 + V_7 + V_9$

3.5 2.5 / 5

✓ - 2.5 pts Missing/incorrect loop label

4.



$$I_s = 3.6A, R_2 = 1\Omega, R_3 = 5\Omega, R_4 = R_5 = 6\Omega$$

$$(1) KCL: 3.6 = \frac{V_3}{5} + \frac{V_4}{6}$$

$$(2) (3.6)(5) = V_3 + 5V_2 \rightarrow 18 = V_3 + 5V_2$$

$$(3) -V_5 + V_2 - V_3 = 0$$

$$(4) KCL: \frac{V_2}{1} + \frac{V_3}{5} = \frac{V_4}{6}$$

$$(5) 6V_2 + V_4 = V_3 \rightarrow V_4 + V_5 = 0 \rightarrow V_4 = -V_5 \quad (6)$$

$$(7) 6V_2 + V_5 = V_4 \rightarrow 6V_2 = V_4 - V_5 \rightarrow 6V_2 = 2V_4 \rightarrow V_4 = 3V_2 \quad (9)$$

$$(10) V_3 + V_5 - V_2 = 0 \rightarrow V_3 + (-V_4) - V_2 = 0, V_3 = V_4 + V_2 \rightarrow V_3 = 4V_2 \quad (12)$$

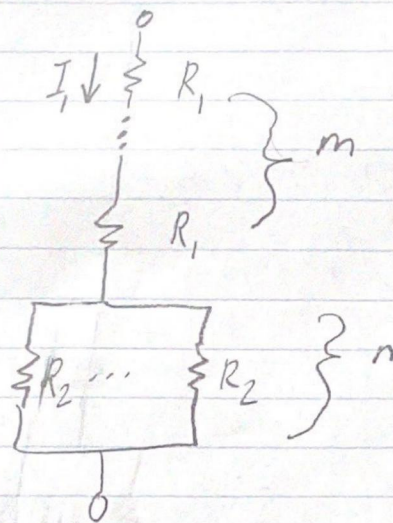
$$(13) 18 = V_3 + 5V_2 \rightarrow 18 = (4V_2) + 5V_2 \rightarrow 18 = 9V_2 \rightarrow V_2 = 2V \rightarrow V_4 = 6V$$

$$(14) 6V_2 + V_5 = V_4 \rightarrow 6(2V) + V_5 = 6V, \begin{matrix} V_5 = -6V \\ I_5 = -1A \end{matrix}$$

4 10 / 10

✓ - 0 pts Correct $V_5 = -1 \text{ V}$, $V_5 = -6 \text{ V}$

5.



$m=15$ resistors of value $R_1=80\Omega$
connected to "11" combo of $n=4$ resistors of
value $R_2=720\Omega$

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

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

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

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

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

$$R_p = 180\Omega$$

$$R_s = 1200\Omega$$

$$\frac{1}{4} = (I_s)^2 (R_s), I_s = 0.0559016994A$$

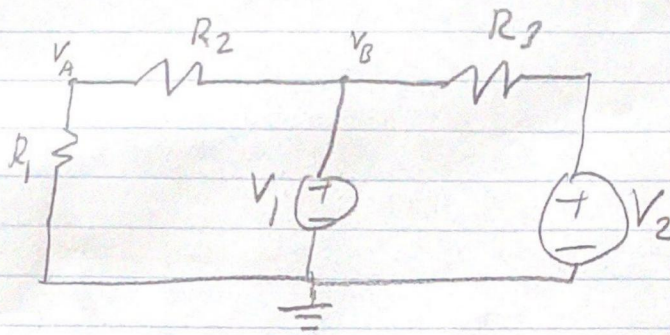
$$\frac{1}{4} = (I_p)^2 (R_p), I_p = 0.0186338998125A$$

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

5 10 / 10

✓ - 0 pts Correct

6.



$$V_A = ?$$

$$V_1 = 4V$$

$$V_2 = 3V$$

$$R_1 = 30\Omega$$

$$R_2 = 10\Omega$$

$$R_3 = 10\Omega$$

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

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

$$V_1 - V_2 = I_3 R_3, 4 - 3 = I_3 (10\Omega), I_3 = \frac{1}{10} A \rightarrow V_3 = 1V \quad (R_3)$$

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

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

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 form?
 b) $B = e^{-j\frac{3\pi}{4}}$
 c) $C = 9e^{-j\frac{\pi}{6}}$

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

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

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

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) $F = 3 - j^4$

$$D = -2e^{j\frac{5\pi}{4}}$$

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

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

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

a) $P = AB$

b) $Q = AB^*$

c) $R = AB$

d) $S = A+B$

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

$$b) B^* = e^{j\frac{3\pi}{4}} \rightarrow AB^* = e^{j\frac{5\pi}{4}} e^{j\frac{3\pi}{4}} = e^{j\frac{8\pi}{4}} = e^{j2\pi} = \boxed{1}$$

$$c) R = e^{j\frac{5\pi}{4}} e^{j\frac{3\pi}{4}} = e^{j\frac{8\pi}{4}} = \boxed{1}$$

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

$$B \rightarrow -\frac{\sqrt{2}}{2} - \frac{j\sqrt{2}}{2}$$

7.1 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 form?
 b) $B = e^{-j\frac{3\pi}{4}}$
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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) $F = 3 - j^4$

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a) $P = AB$

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7.2 2 / 2

✓ - 0 pts Correct

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

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7.3 2 / 2

✓ - 0 pts Correct

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c) $F = 3 - j^4$

$$D = -2e^{j\frac{5\pi}{4}}$$

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

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

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

a) $P = AB$

b) $Q = AB^*$

c) $R = AB$

d) $S = A+B$

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

$$b) B^* = e^{j\frac{3\pi}{4}} \rightarrow AB^* = e^{j\frac{5\pi}{4}} e^{j\frac{3\pi}{4}} = e^{j\frac{8\pi}{4}} = e^{j2\pi} = \boxed{1}$$

$$c) R = e^{j\frac{5\pi}{4}} e^{j\frac{3\pi}{4}} = e^{j\frac{8\pi}{4}} = \boxed{1}$$

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

$$B \rightarrow \frac{-\sqrt{2}}{2} - \frac{j}{2}$$

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 form?
 b) $B = e^{-j\frac{3\pi}{4}}$
 c) $C = 9e^{-j\frac{\pi}{6}}$

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

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

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

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) $F = 3 - j^4$

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$$B \rightarrow \frac{-\sqrt{2}}{2} - \frac{j}{2}$$

8.3 1 / 2

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

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9.1 2 / 2

✓ - 0 pts Correct

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9.2 2 / 2

✓ - 0 pts Correct

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9.3 2 / 2

✓ - 0 pts Correct

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$$B \rightarrow -\frac{\sqrt{2}}{2} - \frac{j}{2}$$

9.4 0 / 2

✓ - 2 pts inCorrect