

Universidad del Valle de Guatemala

Depto. de Ing. Electrónica - IE 2003

Sección

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### Hoja de Trabajo #1

A.  $A = -4 + 5j$

B.  $B = 3 - 2j$

C.  $C = -6 - 5j$

$$\begin{aligned} a) \quad j^5 C^2 (A+B) &= j(-6-5j)(-6-5j)(-4+5j+3-2j) \\ &= j(36+30j+30j+25j^2)(-1+3j) \\ &= j(36-25+60j)(-1+3j) \\ &= j(11+60j)(-1+3j) \\ &= (-11+33j-60j+180j^2)j \\ &= (-11-180-27j)j = \boxed{27-191j} \end{aligned}$$

$$\begin{aligned} b) \quad ((A-A^*)(B+B^*))^* &= ((-4+5j-(-4-5j))(3-2j+3+2j))^* \\ &= (10j \times 6)^* = 60j^* = \boxed{0-60j} \end{aligned}$$

$$\begin{aligned} c) \quad \left(\frac{1}{C}\right) - \left(\frac{1}{B}\right)^* &= \left(\frac{1}{-6-5j}\right)\left(\frac{-6+5j}{(-6+5j)}\right) - \left(\frac{1}{3-2j}\right)\left(\frac{3+2j}{3+2j}\right)^* \\ &= \left(\frac{-6+5j}{36+25}\right) - \left(\frac{3+2j}{9+4}\right)^* \end{aligned}$$

$$= \boxed{\frac{-6+5j}{61} - \frac{3-2j}{13}}$$

$$d) \frac{(A + 3C - B) * (3B + 5C * j) * j}{2}$$

$$= \left[ \frac{(-4 + 5j + 3(-6 - 5j) - (-3 + 2j)) * (3(-3 - 2j) + 5(-6 + 5j) * j)}{2} \right] * j$$

$$= \left[ \frac{(-25 + 12j)}{2} (-21 - 19j) \right] * j$$

$$= \left( \frac{525 + 475j - 252j + 228}{2} \right) * j = \boxed{\frac{753 - 223j}{2}}$$

B. a)  $e^{1-j} = e^1 * e^{-j} = e * [\cos(1) - j \sin(1)] \quad e^{ix} = \cos(x) + j \sin(x)$   
 $= |e \cos(1) - e \sin(1) j|$

b)  $e^{-j} = \cos(-j) + j \sin(-j) = \cos(j) - j \sin(j)$

y  $e^{jj} = \cos(j) + j \sin j$  si sumamos las dos  $e^{-j} + e^{jj} = 2 \cos(j)$

c)  $\Rightarrow \cos(j) = \frac{\cos(-j) + \cos(j)}{2} = \frac{e^{-j} + e^{jj}}{2}$

e)  $e^{jj} = \cos(j) + j \sin j$   $e^{jj} - e^{-j} = j \sin j + j \sin(j)$   
 y  $e^{-j} = \cos(-j) + j \sin(-j)$   $\Rightarrow j \sin(j) = \frac{e^{-j} - e^{jj}}{2}$

C. a)  $-18.5 - 26.1j = \sqrt{18.5^2 + (26.1)^2} \cdot e^{\tan^{-1}\left(\frac{26.1}{18.5}\right)j}$

b)  $17.9 - 12.2j = \sqrt{(17.9)^2 + (12.2)^2} \cdot e^{\tan^{-1}\left(\frac{-12.2}{17.9}\right)j}$

c)  $-21.6 + 31.2j = \sqrt{(21.6)^2 + (31.2)^2} \cdot e^{\tan^{-1}\left(\frac{31.2}{21.6}\right)j}$

D.  $(3+2j)X + (-5-3j)Y = 3e^{30^\circ j} = \frac{3\sqrt{3} + 3j}{2}$

$(-5+3j)X + (3-3j)Y = 20j$

$$X = \frac{\frac{3\sqrt{3}+3j}{2} + 5+3j}{3+2j} \cdot \frac{(3-2j)}{(3-2j)} = \frac{(3\sqrt{3}+3j+5+3j)(3-2j)}{9+4}$$

$$\frac{[\sqrt{3}(18-12) + 30j + [10+6j]Y \cdot (6-4j)] \cdot (-5+3j) + (3-3j)Y}{52} = 20j$$

$$(6\sqrt{3} + 30j + [60 - 40j + 36j + 24]Y)(-5+3j) + 52(3-3j)Y = 52 \cdot 20j$$

$$+ 30\sqrt{3} + 18\sqrt{3}j - 150j - 90 + [84 - 4j](-5+3j)Y + 52(3-3j)Y = 52 \cdot 20j$$

$$52 \cdot 20j + 30\sqrt{3} - 18\sqrt{3}j + 150j + 90 = (-420 + 252 + 20j + 12 + 156 - 156j)Y$$

$$52 \cdot 20j + 30\sqrt{3} - 18\sqrt{3}j + 150j + 90 = (-136j)Y$$

$$Y = \frac{(90 + 1140j) + (30 - 18j)\sqrt{3}}{-136j} \cdot \frac{136j}{136j} = \boxed{Y \approx -2.25 - 1.02j}$$

Substituyendo en (1)

$$(3+2j)X + (-5-3j)(-2.25 - 1.02j) = \frac{3\sqrt{3} + 3j}{2}$$

$$(6+4j)X = -8.19 - 11.85j + \frac{3\sqrt{3} + 3j}{2}$$

$$\Leftrightarrow X \approx \frac{-5.59 - 10.35j}{6+4j} \left( \frac{6-4j}{6-4j} \right) \approx \frac{-74.95 - 39.73j}{36 + 16}$$

$$\boxed{X \approx -2.88 - 1.53j}$$