



$$V_x = I_3 \times j8000$$

$$V_x = j I_3 8000 \quad (3)$$

$$I_x = I_1$$

$$I_x = 0.1 \angle 20^\circ = 0.0917 \angle 20^\circ \Rightarrow \frac{0.04}{3000} + j \frac{0.09}{3000} - \frac{80}{3000} j I_3$$

$$\text{Loop 1} \Rightarrow -0.1 \angle 20^\circ + 3000 I_x + 0.01 V_x = 0$$

$$\Rightarrow 3000 I_x + 0.01 V_x = 0.1 \angle 20^\circ$$

$$(3) \Rightarrow 3000 I_x + 80 j I_3 = 0.04 + j 0.09$$

$$\times j \Rightarrow 80 (j^2) I_3 = 0.04 j + j 0.09 - j 3000 I_x$$

$$\div (-80) \Rightarrow I_3 = -0.0005 j + 0.00125 + j 37.5 I_x$$

$$\Rightarrow I_3 = 0.00125 + j (37.5 I_x - 0.0005) \quad (1)$$

$$\text{Loop 2} = I_2 = -30 I_x$$

$$\text{Loop 3} = 10000 (I_3 - (-30 I_x)) + (-j1000) I_3 + 6000 I_3 + V_x = 0$$

$$\Rightarrow 10,000 I_3 + 300,000 I_x - j1000 I_3 + 6000 I_3 + V_x = 0$$

$$\Rightarrow 16,000 I_3 - j1000 I_3 + 300,000 I_x + V_x = 0$$

$$\Rightarrow I_3 (16,000 - j1000) + 300,000 I_x = -V_x$$

$$(1) \Rightarrow -V_x = (0.00125 + j 37.5 I_x - 0.0005 j) (16,000 - j1000) + 300,000 I_x$$

$$\Rightarrow -V_x = 20 - j1.25 + j600,000 I_x + 37,500 I_x - 8 j - 0.5 + 300,000 I_x$$

$$-V_x = 19.5 + j9.25 + 337,500 I_x + j600,000 I_x$$

$$V_x \quad (2) \Rightarrow V_x = -19.5 + j9.25 - I_x (337,500 + j600,000) \quad (2)$$

$$(3), (4) \Rightarrow (2) \Rightarrow j I_3 8000 = -19.5 + j9.25 - \left( \frac{0.04}{3000} + j \frac{0.09}{3000} - \frac{80}{3000} j I_3 \right) (337,500 + j600,000)$$

$$I_3 \text{ Wolfram} \Rightarrow I_3 = -0.000339 - 0.000576 j \quad (5) \quad 0.000668 \angle 239.52^\circ$$

$$V_x \quad (5) \Rightarrow (3) \quad V_x = j8000 (-0.000339 - 0.000576 j) \Rightarrow 4.607 - 2.71 j \Rightarrow 5.345 \angle -30.5^\circ$$

$$I_x \quad (5) \Rightarrow (4) \quad I_x = \frac{0.04}{3000} + j \frac{0.09}{3000} - j \frac{80}{3000} (-0.000339 - 0.000576 j)$$

$$\Rightarrow 0.0000133 + j0.00003 + j0.00000904 - 0.00001536$$

$$\Rightarrow -0.00000202 + j0.00003904$$

$$\Rightarrow 0.00003909 \angle 92.96^\circ \text{ A}$$

$$= 0.03909 \angle 92.96^\circ \text{ mA}$$