

817 i) a) $v(t) = 10 \cos(4t - 60^\circ)$
 $i(t) = 4 \sin(4t + 50^\circ)$
 $= 4 \cos(4t - 40^\circ)$

$i(t)$ leads $v(t)$ by 20°


b) $v_1(t) = 4 \cos(377t + 10^\circ)$
 $v_2(t) = -20 \cos(377t)$
 $= 20 \cos(377t + 180^\circ)$

$v_2(t)$ leads $v_1(t)$ by 170°

2) a) $-20 \cos(4t + 135^\circ)$
 $= -20 \angle 135^\circ$ or $20 \angle 45^\circ$

b) $8 \sin(20t + 30^\circ)$
 $= 8 \cos(20t + 30^\circ - 90^\circ)$
 $= 8 \cos(20t - 60^\circ)$
 $= 8 \angle -60^\circ$

c) $20 \cos(2t) + 15 \sin(2t)$
 $= 20 \angle 0 + 15 \angle -90$
 $= 25 \angle -36.87^\circ$

3) 

$$V_1 = 10 \cos(50t - 60^\circ)$$

$$V_2 = 12 \cos(50t + 30^\circ) \text{ V}$$

$$\Rightarrow V_1 = 10 \angle -60^\circ, V_2 = 12 \angle 30^\circ$$

$$V = V_1 + V_2 = 10 \angle -60^\circ + 12 \angle 30^\circ$$

$$\Rightarrow \boxed{V = 15.620 \angle -9.805^\circ}$$

4) a) $V_1 = 60 \angle 15^\circ, \omega = 1$
 $V_1(t) = 60 \cos(t + 15^\circ)$

b) $V_2 = 6 + 8j, \omega = 40^\circ$
 $\Rightarrow V_2 = 10 \angle 53.13^\circ$

$$\Rightarrow V_2(t) = 10 \cos(40t + 53.13^\circ)$$

c) $I_1 = 2.8 e^{-\pi/3j}, \omega = 377$
 $= 2.8 \cos(377t - 60^\circ)$

d) $I_2 = 1 - 0.5 - 1.2j, \omega = 10^3$

$$\Rightarrow I_2 = 1.3 \angle -112.61^\circ$$

$$\Rightarrow I_2(t) = 1.3 \cos(10^3t - 112.61^\circ)$$

$$5) a) 2 \frac{di}{dt} + 3i(t) = 4 \cos(2t - 45^\circ), \omega = 2$$

$$2j\omega i(t) + 3i(t) = 4 \cos(2t - 45^\circ)$$

$$i(t)(4j + 3) = 4 \angle -45^\circ$$

$$i(t) = \frac{4 \angle -45^\circ}{4j + 3}$$

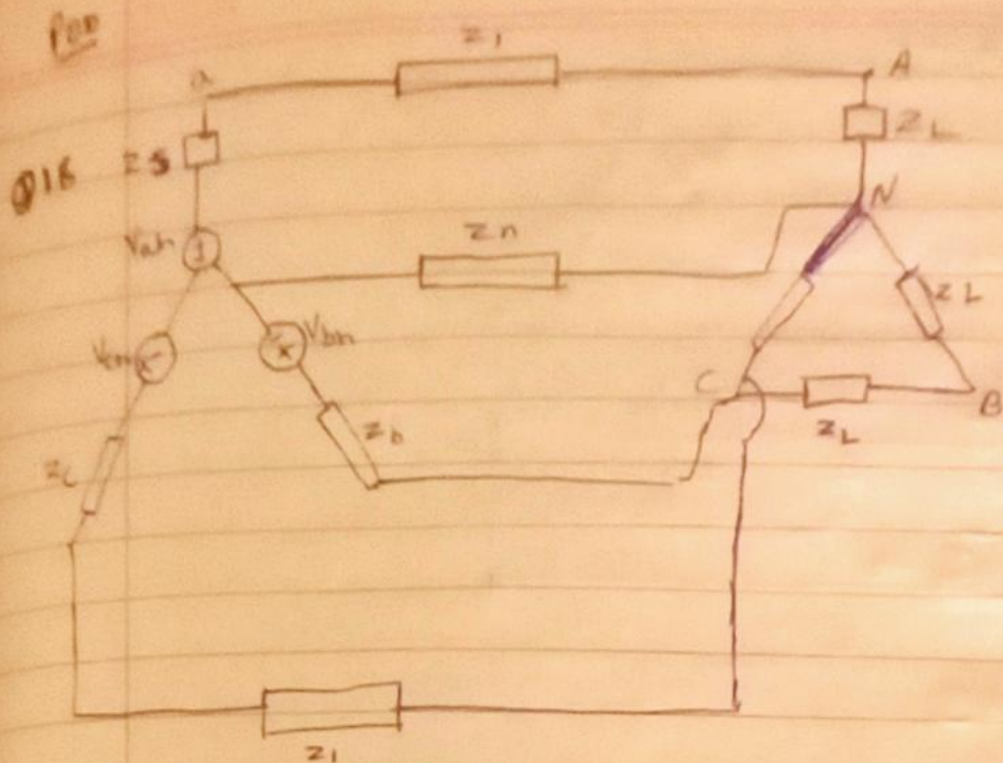
$$\Rightarrow i(t) = 0.8 \angle -98.13^\circ$$

$$b) 10 \int i dt + \frac{di}{dt} + 6i(t) = 5 \cos(5t + 22^\circ), \omega = 5$$

$$\Rightarrow 10 \times -\frac{j}{\omega} \times i(t) + i(t)\omega j + 6i(t) = 5 \angle 22^\circ$$

$$\Rightarrow (6 + 3j)i(t) = 5 \angle 22^\circ$$

$$\Rightarrow i(t) = 0.745 \angle -4.565^\circ$$



$$V_{ab} = V_{an} - V_n$$

$$= 120 \angle 30^\circ - 120 \angle -30^\circ$$

$$V_{ab} = 207.85 \angle 60^\circ \text{ V}$$

$$V_{bc} = V_{bn} - V_{cn}$$

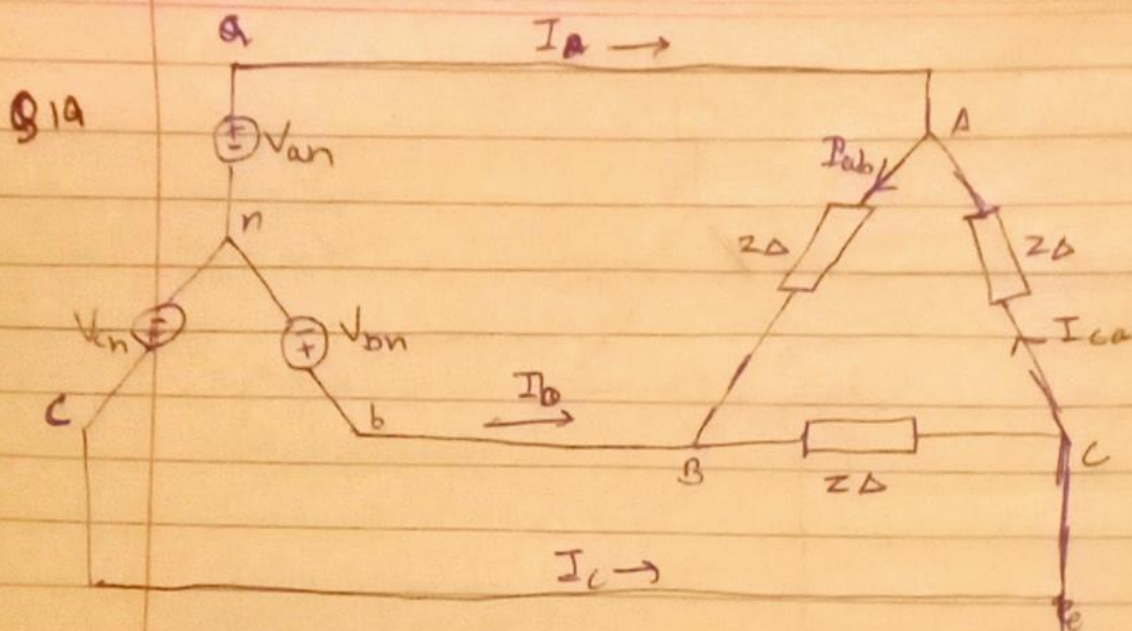
$$= 207.85 \angle 60^\circ \text{ V}$$

$$V_{ca} = 207.85 \angle 60^\circ \text{ V}$$

$$\therefore I_A = \frac{120 \angle 30^\circ}{28 + 20j} = 3.73 \angle -5.53^\circ \text{ A}$$

$$I_B = \frac{V_{bn}}{(25 + 20j)} = 3.73 \angle -128.66^\circ \text{ A}$$

$$I_C = \frac{V_{cn}}{26 + 20j} = 3.73 \angle 111.54^\circ \text{ A}$$



$$V_{ab} = 120 \angle -20^\circ \text{ V}$$

$$V_{bc} = 120 \angle 140^\circ \text{ V}$$

$$V_{ca} = 120 \angle -260^\circ \text{ V}$$

$$\therefore I_{ab} = 6 \angle -60^\circ \text{ A}$$

$$I_{bc} = 6 \angle -180^\circ \text{ A}$$

$$I_{ca} = 6 \angle 60^\circ \text{ A}$$

$$\therefore I_a = I_{ab} - I_{ba} = 10.392 \angle -90^\circ \text{ A}$$

$$I_b + I_{ab} = I_{bc}$$

$$\Rightarrow I_b = 10.392 \angle 180^\circ \text{ A}$$

$$I_c = I_{ca} - I_{bc}$$

$$\Rightarrow I_c = 10.392 \angle 30^\circ \text{ A}$$