a) Since the three sources are balanced and since the three total line impedances are the same, we know that \( V_N = 0 \). Consequently, \( I_o = 0 \).

The individual currents are:

\[
I_A = \frac{240 \angle 0^\circ}{80 + j60} = 2.4 \angle -36.87^\circ \text{ A}
\]

\[
I_B = \frac{240 \angle 120^\circ}{80 + j60} = 2.4 \angle 83.13^\circ \text{ A}
\]

\[
I_C = \frac{240 \angle -120^\circ}{80 + j60} = 2.4 \angle -156.87^\circ \text{ A}
\]
Evidently, the three line currents form a balanced set, thus,

\[ I_0 = I_A + I_B + I_C = 0 \]

b) \[ V_{BN} = 2_{BN} \cdot I_B = (79 + j52) \cdot I_B \]
\[ = 226.99 \angle 116.48^\circ \text{ V} \]

c) \[ V_{BC} = V_{BN} + V_{NC} = V_{BN} - V_{CN} \]
\[ V_{CN} = 2_{CN} \cdot I_C = (78 + j54) \cdot I_C \]
\[ = 222.36 \angle -124.62^\circ \text{ V} \]
\[ \Rightarrow V_{BC} = (-101.22 + j203.17) - (-125.41 - j183.89) \]
\[ = 23.79 + j387.46 = 387.79 \angle 86.48^\circ \text{ V} \]

d) In spite of the balanced currents, the circuit is unbalanced.