

3-phase homework

13.1 For each set of voltages given below, state whether it is a balanced set or not. If balanced, state whether the sequence is positive or negative. If not balanced, explain why.

$$\begin{aligned} \text{(a)} \quad V_a &= 294 \sin 377t \\ V_b &= 294 \sin (377t + 120^\circ) \\ V_c &= 294 \sin (377t - 120^\circ) \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad V_a &= 170 \sin (377t - 60^\circ) \\ V_b &= 170 \sin (377t + 10^\circ) \\ V_c &= 170 \sin (377t - 180^\circ) \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad V_a &= 400 \sin 377t \\ V_b &= -400 \cos (377t - 30^\circ) \\ V_c &= 400 \cos (377t + 30^\circ) \end{aligned}$$

13.8' The magnitude of the internal phase voltage of a Y connected 3-phase source is 125V. The source has internal impedance $0.1 + j0.2 \Omega / \phi$. The source is connected to a distribution line that has an impedance of $0.1 + j0.8 \Omega / \phi$. The load impedance is $19.8 + j14.5 \Omega / \phi$. The source has negative phase sequence. Use $V_{a'n}$ as reference.

- (a) Draw the single phase equivalent circuit
- (b) Find the three line currents
- (c) Find the 3 phase voltages at the load
- (d) Find the 3 line voltages at the load
- (e) Find the voltage V_{ca} at the source terminals.