

$$V_m = (120 - E) \left( \frac{R_a}{R_a + R_1 + R_2} \right) + E$$

*At start – up,  $E = 0$*

$$V_m = (120 - 0) \left( \frac{0.1}{0.1 + 0.3 + 0.1} \right) + 0$$

$$V_m = 120 \times \frac{0.1}{0.5}$$

$$V_m = 24V$$

$$I_a = \frac{V_m - E}{R_a}$$

$$I_a = \frac{24}{0.1}$$

$$I_a = 240A$$

*When contactor 1A closes, assume  $E = 24V$*

$$V_m = (120 - 24) \left( \frac{0.1}{0.1 + 0.1} \right) + 24$$

$$V_m = 96 \times \frac{0.1}{0.2} + 24$$

$$V_m = 72V$$

$$I_a = \frac{V_m - E}{R_a}$$

$$I_a = \frac{48}{0.1}$$

$$I_a = 480A$$

*When contactor 2A closes, assume  $E = 72V$*

$$V_m = 120 - 72$$

$$V_m = 48V$$

$$I_a = \frac{V_m}{R_a}$$

$$I_a = \frac{48}{0.1}$$

$$I_a = 480A$$