

EENG382 HW03 – AUTHOR'S SOLUTIONS

NOTE: I have not yet verified that the author's solutions are, in fact, correct.

**Prob 11.18**

$$\text{P 11.18 [a] } \mathbf{I}_{AB} = \frac{480/0^\circ}{2.4 - j0.7} = 192/\underline{16.26^\circ} \text{ A (rms)}$$

$$\mathbf{I}_{BC} = \frac{480/120^\circ}{8 + j6} = 48/\underline{83.13^\circ} \text{ A (rms)}$$

$$\mathbf{I}_{CA} = \frac{480/(-120^\circ)}{20} = 24/\underline{-120^\circ} \text{ A (rms)}$$

$$\begin{aligned} \text{[b] } \mathbf{I}_{aA} &= \mathbf{I}_{AB} - \mathbf{I}_{CA} \\ &= 210/\underline{20.79^\circ} \end{aligned}$$

$$\begin{aligned} \mathbf{I}_{bB} &= \mathbf{I}_{BC} - \mathbf{I}_{AB} \\ &= 178.68/\underline{-178.04^\circ} \end{aligned}$$

$$\begin{aligned} \mathbf{I}_{cC} &= \mathbf{I}_{CA} - \mathbf{I}_{BC} \\ &= 70.7/\underline{-104.53^\circ} \end{aligned}$$

**Prob 11.24**

$$\text{P 11.24 [a] } S_{T\Delta} = 14,000/41.41^\circ - 9000/53.13^\circ = 5.5/22^\circ \text{ kVA}$$

$$S_{\Delta} = S_{T\Delta}/3 = 1833.46/22^\circ \text{ VA}$$

$$\text{[b] } |\mathbf{V}_{an}| = \left| \frac{3000/53.13^\circ}{10/(-30^\circ)} \right| = 300 \text{ V (rms)}$$

$$|\mathbf{V}_{line}| = |\mathbf{V}_{ab}| = \sqrt{3}|\mathbf{V}_{an}| = 300\sqrt{3} = 519.62 \text{ V (rms)}$$

**Prob 11.50**

P 11.50 [a] Negative phase sequence:

$$\mathbf{V}_{AB} = 240\sqrt{3}/\underline{-30^\circ} \text{ V}$$

$$\mathbf{V}_{BC} = 240\sqrt{3}/\underline{90^\circ} \text{ V}$$

$$\mathbf{V}_{CA} = 240\sqrt{3}/\underline{-150^\circ} \text{ V}$$

$$\mathbf{I}_{AB} = \frac{240\sqrt{3}/\underline{-30^\circ}}{20/\underline{30^\circ}} = 20.78/\underline{-60^\circ} \text{ A}$$

$$\mathbf{I}_{BC} = \frac{240\sqrt{3}/\underline{90^\circ}}{60/\underline{0^\circ}} = 6.93/\underline{90^\circ} \text{ A}$$

$$\mathbf{I}_{CA} = \frac{240\sqrt{3}/\underline{-150^\circ}}{40/\underline{-30^\circ}} = 10.39/\underline{-120^\circ} \text{ A}$$

$$\mathbf{I}_{aA} = \mathbf{I}_{AB} + \mathbf{I}_{AC} = 18/\underline{-30^\circ} \text{ A}$$

$$\mathbf{I}_{cC} = \mathbf{I}_{CB} + \mathbf{I}_{CA} = \mathbf{I}_{CA} + \mathbf{I}_{BC} = 16.75/\underline{-108.06^\circ}$$

$$W_{m1} = 240\sqrt{3}(18) \cos(-30 + 30^\circ) = 7482.46 \text{ W}$$

$$W_{m2} = 240\sqrt{3}(16.75) \cos(-90 + 108.07^\circ) = 6621.23 \text{ W}$$

[b]  $W_{m1} + W_{m2} = 14,103.69 \text{ W}$ 

$$P_A = (12\sqrt{3})^2(20 \cos 30^\circ) = 7482.46 \text{ W}$$

$$P_B = (4\sqrt{3})^2(60) = 2880 \text{ W}$$

$$P_C = (6\sqrt{3})^2[40 \cos(-30^\circ)] = 3741.23 \text{ W}$$

$$P_A + P_B + P_C = 14,103.69 = W_{m1} + W_{m2}$$