

يا لطيف

رضا ادينه نوري

۹۸۱۴۳۵۳

تمرین سه ۲ تحلیل سیستم انرژی

#9 { $800 \text{ kW} \rightarrow \Delta$
 $S_n = 1000 \text{ kVA}$
 $\frac{138}{13.8}$

$$|I_L| = \frac{P}{\sqrt{3} V_{HV}} = \frac{8000}{\sqrt{3} \times 138} = 33.47 \text{ A}$$

$$R = \frac{\frac{V_{HV}}{\sqrt{3}}}{I_{Line}} = \frac{\frac{138000}{\sqrt{3}}}{33.47} = 2380 \Omega$$

#12 { $S_n = 200 \text{ MVA}, 22.5 \text{ kV}$
 $\cos \theta = 0.8$ پس فاز
 $200 \text{ MVA}, 345 \text{ Y} / 20.5 \Delta \text{ kV}$

مقدارهای هر سه ترانس (الف)
 $\frac{200}{3} = 66.6 \text{ MVA}$
 یک فاز

مقدارهای ولتاژ
 $\frac{\frac{345}{\sqrt{3}}}{20.5} = 9.7 \text{ kV}$

ب) $Z = \frac{V^2}{S} \angle \cos^{-1}(0.8) = \frac{(22.5)^2}{180} \angle 36.87^\circ = 2.81 \angle 36.87^\circ \text{ LV}$

$V_{base} = 20.5 \text{ kV}, S_{base} = 100 \text{ MVA} \Rightarrow Z_{base} = \frac{(20.5)^2}{100} = 4.20 \Omega$

$Z_{p.u} = \frac{Z_{LV}}{Z_{base}} = \frac{2.81}{4.20} \angle 36.87 = 7669 \angle 36.87 \text{ P.u}$

#13

$$\begin{cases} 120 \text{ MVA}, 19.5 \text{ kV} \\ X_s = 1.5 \text{ pu} \\ S_n = 150 \text{ MVA} \\ 230 \text{ Y}/18 \Delta \text{ kV} \end{cases}$$

$$Z_{\text{new(pu)}} = Z_{\text{old(pu)}} \times \left(\frac{V_{\text{old}}}{V_{\text{new}}} \right)^2 \times \left(\frac{S_{\text{new}}}{S_{\text{old}}} \right)$$

$$Z_{\text{new(G)}} = 1.5 \times \left(\frac{19.5}{230} \right)^2 \times \left(\frac{100}{120} \right) = 8.9 \times 10^{-3} \text{ pu}$$

$$Z_{\text{new(T)}} = 0.1 \times \left(\frac{230}{230} \right)^2 \times \left(\frac{100}{150} \right) = 0.06 \text{ pu}$$

#14

$$\begin{cases} 5000 \text{ kVA} \\ \frac{115}{13.2} \text{ kV} \end{cases}$$

$$Z_n = 0.007 + j0.075$$

$$Z_{\text{Tr}} = \left(\frac{10}{5} \right) \cdot (0.007 + j0.075) = 0.014 + j0.150 \text{ pu}$$

$$V_s = 1 \text{ pu}$$

$$Z_L = 0.02 + j11 \text{ pu}$$

$$\Rightarrow |Z|_{\text{Load}} = \frac{(13.2)^2 \times 1000}{3400 \times 0.85} = 43.56$$

$$Z_{\text{base-Load}} = \frac{(13.2)^2}{10} = 17.42 \Omega$$

$$Z_{\text{Load}} = \frac{43.56}{17.42} \angle -1 \text{ deg} (0.85) = 2.50 \angle -31.80$$

$$\Rightarrow 2.125 + j1.317 \text{ pu}$$

$$I = \frac{V_s}{Z_{\text{Tr}} + Z_{\text{Line}} + Z_{\text{Load}}} = \frac{1}{0.014 + 0.02 + 2.125 + j(0.150 + 0.1 + 1.317)} = \frac{1}{2.66 \angle -35.9}$$

$$\Rightarrow I = 0.375 \angle -36 \text{ pu}$$

$$V_{R, \text{FL}} = 0.375 \angle -35.97 \cdot (2.5 \angle -31.8) = 0.937 \angle -4.17 \text{ pu}$$

$$V_{R, \text{NL}} = V_s = 1 \rightarrow V.R = \frac{V_{R, \text{NL}} - V_{R, \text{FL}}}{V_{R, \text{FL}}} \times 100 = \frac{1 - 0.937}{0.937} \times 100 = 6.72 \%$$

#15

$$\begin{cases} G_1: X'' = 0.20 \text{ pu}, 13.8 \text{ kV}, 20 \text{ MVA} \\ G_2: X'' = 0.20 \text{ pu}, 18 \text{ kV}, 30 \text{ MVA} \\ G_3: X'' = 0.20 \text{ pu}, 20 \text{ kV}, 30 \text{ MVA} \\ T_1: X = \%, 220 \text{ Y}/13.8 \Delta \text{ kV}, 25 \text{ MVA} \\ T_2: X = \%, 127/18 \text{ kV}, 10 \text{ MVA} \\ T_3: X = \%, 220 \text{ Y}/22 \text{ kV}, 35 \text{ MVA} \end{cases}$$



