Tarea #4

Luis Fernando Tejada 8-950-470 IEE-141

4-16 GS: P=6, "Y", S=1 MVA, V=3.2 KV, FP=0.9 (-), f=60 Hz, R_A=0.75Ω, P_c=8 KW, $P_{f\&V}$=10 KW

"Y" ⇒ $I_L = I_A$

a) $I_A = I_L = \frac{P}{\sqrt{3}\,V_{LL}} = \frac{1\,MVA}{\sqrt{3}(3.2\,KV)} = 180.42\,A$ $\quad \theta = \cos^{-1}(0.9) = 25.84°$

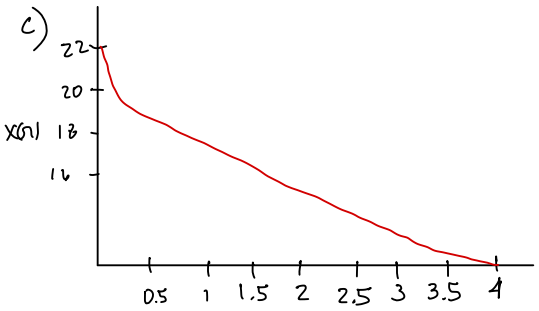
$V_\phi = \frac{3.2\,KV}{\sqrt{3}} = 1847.52\,V$

$E_A = \frac{2447}{\sqrt{3}} = 1412.78\,V$

$X_S = \frac{1412.78\,V}{180.42\,A} = 7.83\,\Omega$

b) $X_{SU} = \frac{\frac{4470\,V}{\sqrt{3}}}{175\,A} = 14.75\,\Omega$

c)



4-17 a) $I_A = I_L = \frac{S}{\sqrt{3}\,V_T} = \frac{1\,MVA}{\sqrt{3}(3.2\,KV)} = 180.42\,A$ $\quad \theta = \cos^{-1}(0.9) = 25.84°$

$I_A = 180.42\,A \angle -25.84°$

$V_\phi = \frac{3.2\,KV}{\sqrt{3}} = 1847.52\,V$

$E_A = V_\phi + R_A I_A + jX_S I_A$

$E_A = 1847.52\,V \angle 0° + (0.75\Omega)(180.42\,A \angle -25.84°) + j(7.83\Omega)(180.42\,A \angle -25.84°)$

$E_A = 2849.58 \angle 25.27°$

b) $\sqrt{3}(2849.58) = 4935.62\,V$

$I_F = 3.24\,A$

4-18 $V_R(\%) = \frac{V_{T,NL} - V_{T,FL}}{V_{T,FL}} \times 100\% = \frac{4935.62\,V - 3200}{3200} \times 100\% = 54.24\%$

4-19 $V_T = \sqrt{3}(2849.58) = \boxed{4935.62\,V}$

4-20 $\boxed{P_{CU} = 3I_A^2 R_A = 3(180.42A)^2(0.7\Omega) = 68.36KW}$

$P_{OUT} = S\,PF = (1MVA)(0.9) = 900KW$

$P_{CU} = 3I_A^2 R_A = 3(180.42A)^2(0.7\Omega) = 68.36KW$

$P_{F\&W} = 10KW$

$P_{core} = 8KW$

$P_{STRAY} = 0$

$$P_{IN} = P_{OUT} + P_{CU} + P_{F\&W} + P_{core} + \cancel{P_{STRAY}}^{0} = 900KW + 68.36KW + 10KW + 8KW = 986.36\,KW$$

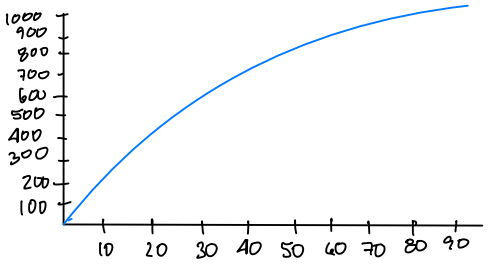
4-21 $\boxed{T_{APL} = \dfrac{P_{IN}}{\omega_m} = \dfrac{986.36KW}{(1200rpm)\left(\frac{2\pi}{1r}rad\right)\left(\frac{1min}{60s}\right)} = 7849.20\,N\cdot m}$

4-22 $\boxed{\delta = 25.27°}$

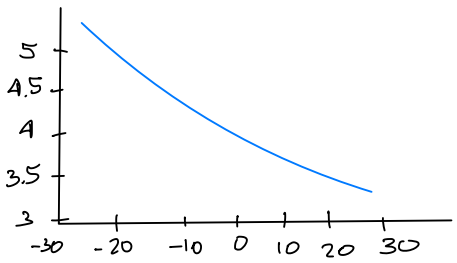
4-23 $V_\phi = 1847.52V$

$$\boxed{P_{MAX} = \frac{3V_\phi E_A}{X_S} = \frac{3(1847.52V)(2849.58)}{(7.83\Omega)} = 2017.11\,KW}$$

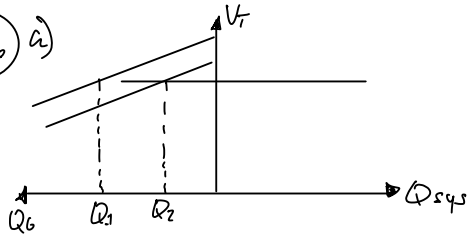
4-24

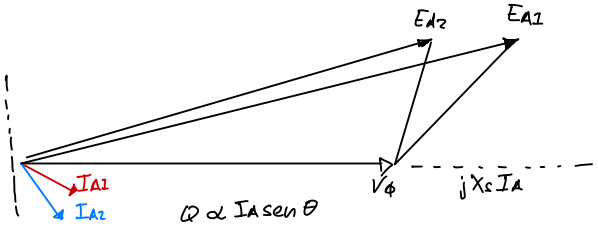


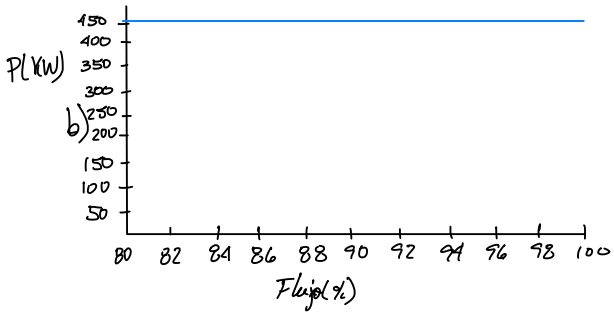
4-25



4-26 a)







c) $I_A = I_L = 180.92\ A$

$V_\phi = 1847.52V$