ECE 333

Exam I Solution, Spring 2000

#1 $\frac{3\times 484}{\sqrt{3}\times 208\times 6} = \boxed{0.67}$ $\quad Q_{1\phi} = \sqrt{\left(\frac{208}{\sqrt{3}}\times 6\right)^2 - 484^2} = 534 = 208^2 \times 2\pi 60 C$ $\quad \boxed{C = 33\mu F}$

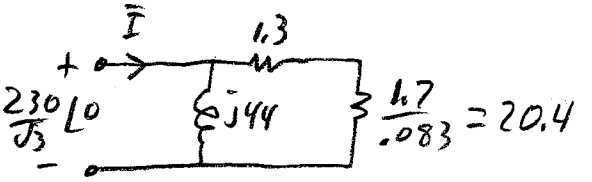
$I = \frac{484}{208/\sqrt{3}} = \boxed{4A}$ $\quad |\bar{S}| = \sqrt{10682 + 484^2} = 1173 = \frac{208}{\sqrt{3}} I$ $\quad \boxed{I = 10A}$

#2 $\bar{V}_S = j.05\left(\frac{120}{83}\right) + 120\angle 0 = 120 + j6 = 120.15$

$VR = \frac{120.15 - 120}{120} \times 100 = \boxed{.15\%}$ $\quad I_{SC} = \frac{100}{5} \times I_{rated} = \boxed{1666A}$

#3 $X_m = \frac{230/\sqrt{3}}{3} = 44\Omega$ $\quad r_1 + r_2 = \frac{430}{12^2} = 3$ $\quad r_2 = 1.7\Omega$

$S = \frac{100}{1200} = .0833$



$\bar{I} = \frac{230/\sqrt{3}}{j44} + \frac{230/\sqrt{3}}{21.7} = -j3 + 6$ $\quad \boxed{|\bar{I}| = 6.7A}$

#4 (a) $P_{OUT} = 25 \times 746 = 18{,}650 w$ $\quad P_{IN} = \frac{P_{OUT}}{.85} = 21{,}941 w$

$|\bar{S}| = \frac{21{,}941}{.8} = \sqrt{3}\times 480 \times I$ $\quad \boxed{I = 33A}$

(b) For 40 Hz, $V = 480\left(\frac{40}{60}\right)$, so $\frac{21{,}941}{.8} = \sqrt{3}\times 480 \times \frac{40}{60} \times I$ $\quad \boxed{I = 50A}$

(c) η will be less because of higher currents

Power factor will be about same