KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Electrical Engineering Department

EE 466-03 Major Examination 1 Term 062

Course	**EE 466**
Date	**March 27, 2007**
Time	**18:30-19:45**
Place	**59-2017**

Student Name:_____

Student Id # _____

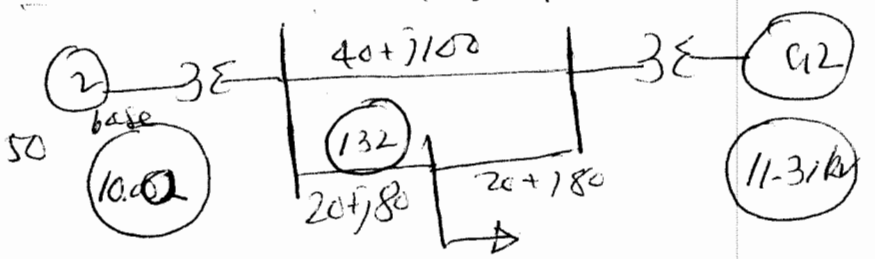
Student Sequence #----------

Section Number **03**

Question #	Score
Q 1	/30
Q 2	/45
Q 3	/25

Model

Q2 a)



Line base = 132 kV;

G1 base = $\frac{132(12.2)}{161} = \underline{10.0\text{ kV}}$

G2 base = $\frac{132(13.8)}{162} = 11.32$

$X_{g_1} = 0.15\left(\frac{100}{50}\right)\frac{12.2^2}{10^2} = \underline{0.4463}$; $X_{g_2} = 0.15\frac{100}{20}\frac{13.8^2}{10.32^2} = \underline{1.1166}$

$X_{T_1} = 0.1\left(\frac{100}{80}\right)\frac{12.22^2}{10^2} = \underline{0.18596} = 0.1 + \frac{100}{80}\frac{161^2}{132^2}$

$X_{T_2} = 0.1\left(\frac{100}{40}\right)\frac{13.8^2}{11.312} = \underline{0.3719\,pu}$

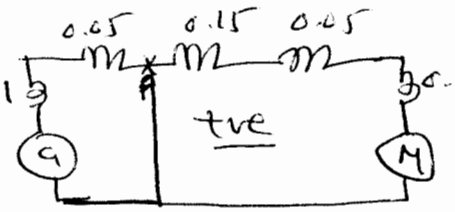
$Z_{base\ line} = 132^2/100 = 174.24\ \Omega$; $Z_{40+j80} = \frac{20+j80}{174.24} = \underline{0.2296+j0.9183}$

$Z_{20+j80} = \underline{0.1148+j0.4591}$

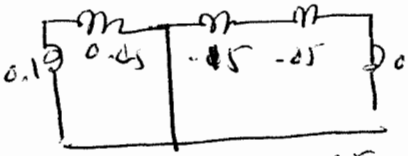
Load (Parallel): $R = \frac{V^2}{P} = \frac{132^2}{40} = 592.9$, $r = \frac{592.9}{174.24} = \underline{3.402\,pu}$

$X = \frac{V^2}{Q} = \frac{132^2}{30} = 790.53$; $X = \underline{4.537}$

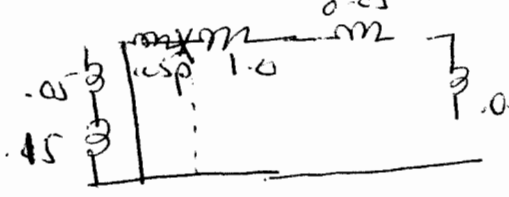
Q2(b)



$Z_1 \Rightarrow Z_1 = 0.15 // 0.3 = 0.1$



$Z_2 \Rightarrow Z_2 = 0.1$



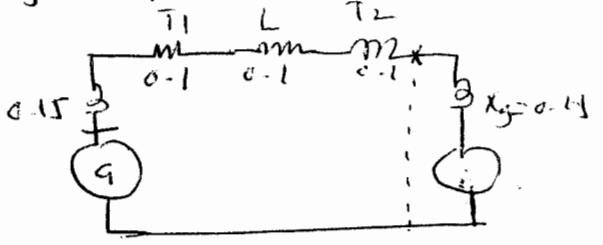
$Z_0 = 0.05$

Line-Ground $= i_1 = i_2 = i_0 = \frac{V_{-0}}{Z_1+Z_2+Z_0} = \frac{1.0}{j(0.1+0.1+0.05)} = \underline{-4.0\,pu}$

$I_F = 3i_1 = \underline{-12.0\,pu}$

EE466-03 Solution to Major Exam I

Q1 a) No change on per unit reactances



$V_f = 10.6\,KV = \frac{10.6}{11} = 0.9636$ pu

$Z_f = 0.15 // (0.45) = 0.1125$

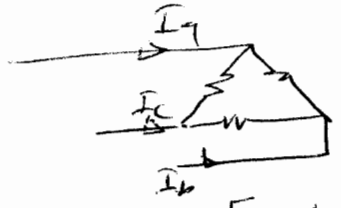
$I_f = V_f / Z_f = 8.565$ pu $\quad I_{base} = \frac{25*10^3}{\sqrt{3}(11)} = 1312.2\,A$

$I_{f(A)} = 1312.2 * (8.581) = 11,239\,A\angle -90$

(a) $I_{fa} = \frac{8.565(0.45)}{0.6} = 6.4237 = 8429.24\,A$

$I_{fg} = \frac{8.565(0.11)}{0.6} = 2.14125 = 2809.74$

(b)



$I_A + I_B + I_C = 0$

$10\angle 30 + 15\angle -60 + I_C = 0 \Rightarrow I_C = 18\angle 114^\circ$

$$\begin{bmatrix} I_0 \\ I_1 \\ I_2 \end{bmatrix} = \frac{1}{3}\begin{bmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{bmatrix}\begin{bmatrix} 10\angle 30 \\ 15\angle -60 \\ 18\angle 114 \end{bmatrix}$$

$$= \begin{bmatrix} 0 \\ 10.35 + j9.3 \\ -1.7 - j4.3 \end{bmatrix} = \begin{bmatrix} 0 \\ 14\angle 42 \\ 4.65\angle 248 \end{bmatrix} \quad \begin{bmatrix} I_{B0} \\ I_{B1} \\ I_{B2} \end{bmatrix} = \begin{bmatrix} 0 \\ 14\angle 28 \\ 4.65\angle 8 \end{bmatrix}$$

Q2