ECE 3600 Final Exam Information

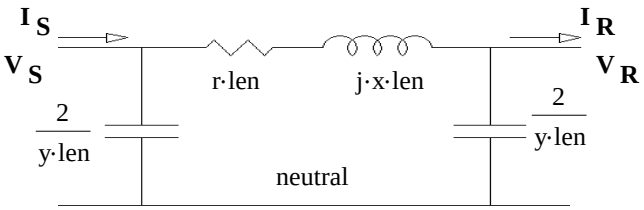
You may write more on this sheet. You may also use Exam 1, 2 & 3 Information sheets

Transmission Lines

		Units				Units
line length:	len , d	m or km				
Resistance per unit length:	r	$\frac{\Omega}{m}$ or $\frac{\Omega}{km}$				
Inductance per unit length:	l	$\frac{H}{m}$ or $\frac{H}{km}$	OR	Inductive reactance per unit length:	x	$\frac{\Omega}{m}$ or $\frac{\Omega}{km}$
Capacitance per unit length:	c	$\frac{F}{m}$ or $\frac{F}{km}$	OR	Admittance per unit length:	y	$\frac{S}{m}$ or $\frac{S}{km}$
Conductance to ground:	g	$\frac{S}{m}$ or $\frac{S}{km}$		Common assumption:		$g = 0 \cdot \frac{S}{km}$

stick to the same unit length for all parameters
miles may also be used

Medium-length Lines:
80 - 240 km
(50 to 150 miles)



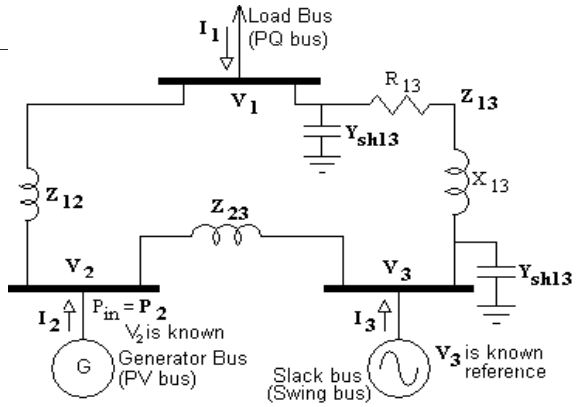
Power Flow

Admittance Matrix

$$\begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} Y_{11} & Y_{12} & Y_{13} \\ Y_{21} & Y_{22} & Y_{23} \\ Y_{31} & Y_{32} & Y_{33} \end{bmatrix} \cdot \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix}$$

$Y_{nn} = \sum$ of all admittances connected to bus n

Y_{mn} $_{m \neq n}$ = - admittance connected between busses n & m



Faults

Symmetrical faults Just analyze on a normal per-phase basis

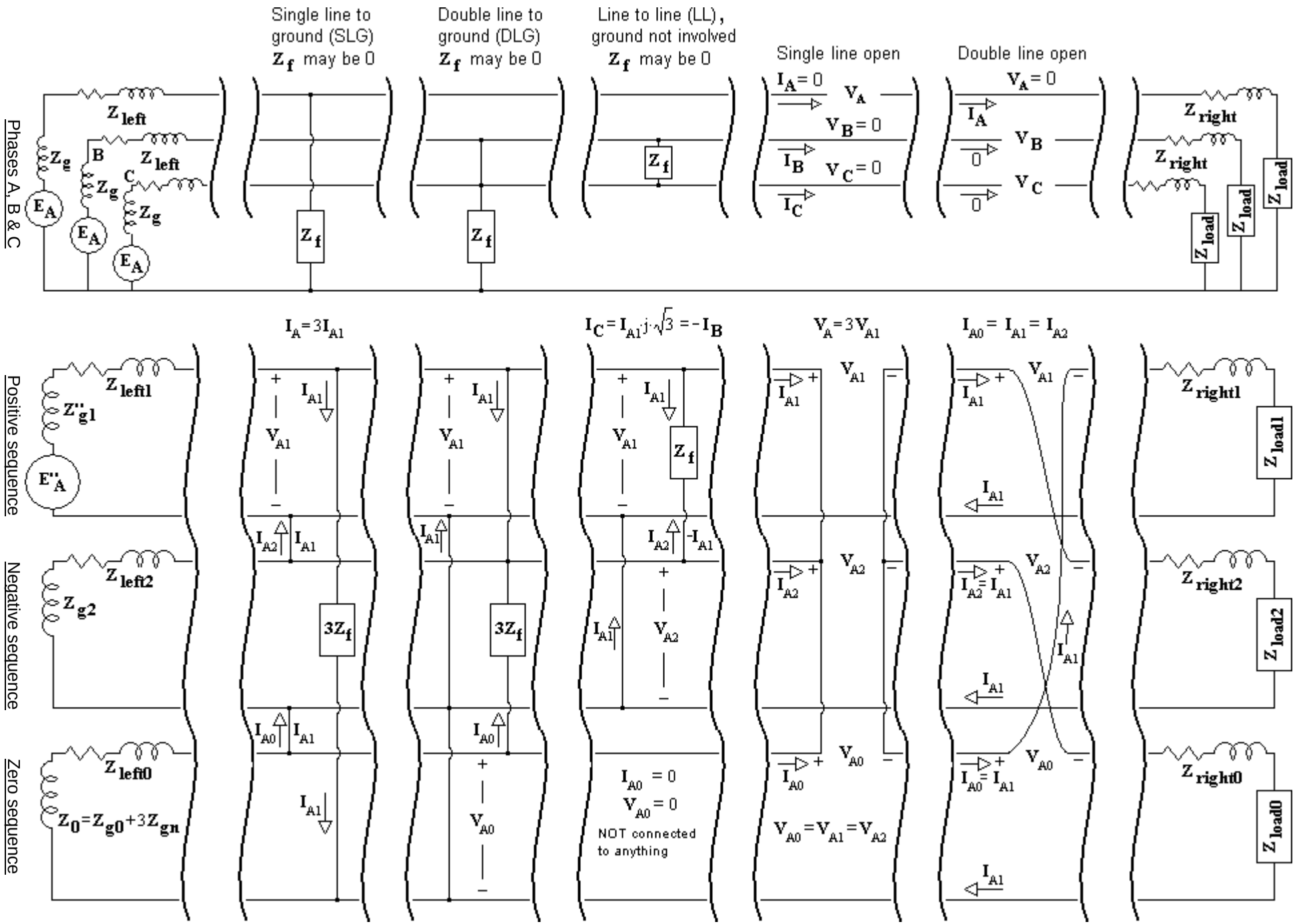
Unsymmetrical Faults

$$\begin{bmatrix} V_A \\ V_B \\ V_C \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & a^2 & a \\ 1 & a & a^2 \end{bmatrix} \cdot \begin{bmatrix} V_{A0} \\ V_{A1} \\ V_{A2} \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 240^o & 120^o \\ 1 & 120^o & 240^o \end{bmatrix} \cdot \begin{bmatrix} V_{A0} \\ V_{A1} \\ V_{A2} \end{bmatrix} \qquad \begin{bmatrix} V_{A0} \\ V_{A1} \\ V_{A2} \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{bmatrix} \cdot \begin{bmatrix} V_A \\ V_B \\ V_C \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & 1 & 1 \\ 1 & 120^o & 240^o \\ 1 & 240^o & 120^o \end{bmatrix} \cdot \begin{bmatrix} V_A \\ V_B \\ V_C \end{bmatrix}$$

Pre-Fault Setup Find pre-fault V_T and I_{gen}. $E''_A = V_T - I_{gen} \cdot Z''_g$

It can be helpful to find E_{ThA} and all the Thevenin impedances

Circuits are on the back of this sheet


Phases A, B & C
Positive sequence
Negative sequence
Zero sequence
Single line to ground (SLG) Z_f may be 0
Double line to ground (DLG) Z_f may be 0
Line to line (LL), ground not involved Z_f may be 0
Single line open
Double line open
Z_{left}
Z_g
E_A
Z_f
$I_A = 0$
$V_B = 0$
I_B
$V_C = 0$
I_C
$V_A = 0$
I_A
V_B
V_C
Z_{right}
Z_{load}
$I_A = 3I_{A1}$
$I_C = I_{A1} \cdot j \cdot \sqrt{3} = -I_B$
$V_A = 3V_{A1}$
$I_{A0} = I_{A1} = I_{A2}$
Z''_{g1}
E''_A
Z_{left1}
Z_{left2}
Z_{g2}
Z_{left0}
$Z_0 = Z_{g0} + 3Z_{gn}$
$3Z_f$
V_{A1}
I_{A1}
V_{A2}
I_{A2}
V_{A0}
I_{A0}
$-I_{A1}$
$I_{A0} = 0$
$V_{A0} = 0$
NOT connected to anything
$V_{A0} = V_{A1} = V_{A2}$
Z_{right1}
Z_{load1}
Z_{right2}
Z_{load2}
Z_{right0}
Z_{load0}