

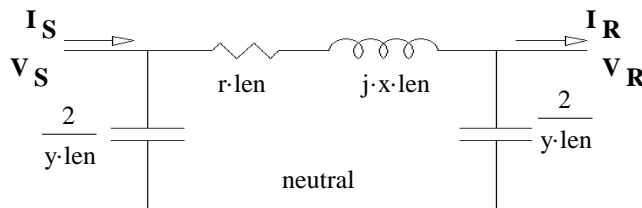
ECE 3600 Final Exam Information

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

Transmission Lines

line length:	len , d	<u>Units</u> m or km	stick to the same unit length for all parameters miles may also be used	
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: $g = 0 \cdot \frac{S}{km}$	

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



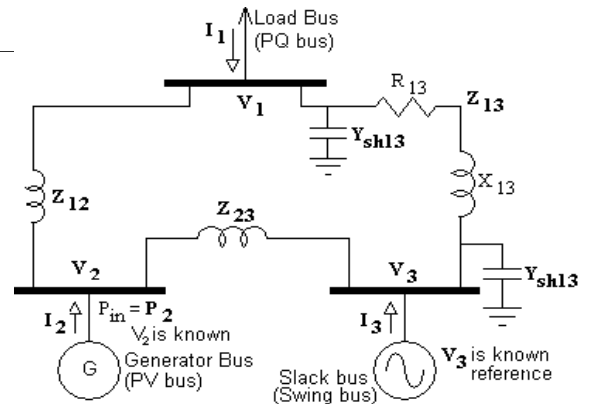
Power Flow

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

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



Faults

Symmetrical faults Just analyze on a normal per-phase basis

Unsymmetrical Faults

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

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

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

Circuits are on the back of this sheet

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

