

**Electrical and Computer Engineering**  
**Fall 2023 COMPREHENSIVE/BREADTH EXAM**

Problems 2/3/4

TTG Area: Power System

ECGR 4141: Power  
System Analysis-I

1. The three-phase power and line-line ratings of the electric power system shown in figure 1 are given below.

G <sub>1</sub> :	60 MVA	18kV	X=7%
T <sub>1</sub> :	50 MVA	20/200kV	X=10%
T <sub>2</sub> :	50 MVA	200/20kV	X=10%
M:	43.2 MVA	18kV	X=8%
Line:		200kV	Z=100 + j200 ohms

- a) Draw an impedance diagram showing all impedances in per unit on a 150-MVA base. Choose 20kV as the voltage base for generator.
- b) The motor is drawing 45MVA, 0.85 power factor lagging at a line-to-line terminal voltage of 18kV. Determine the terminal voltage and the internal emf of the generator in per unit and in kV.

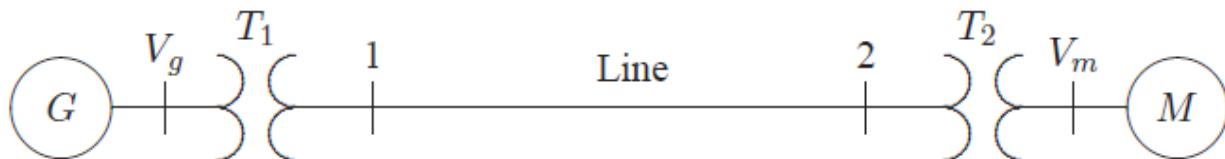


Figure 1: One line diagram of an electric power system