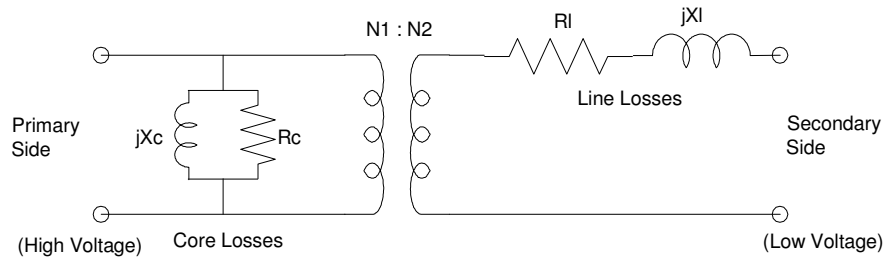# ECE 111: Homework 16

ECE 331 Energy Conversion - Due Monday, May 6th

1) Determine the circuit model for a 13.2kV : 240V transformer is tested with the following test results:

Transformer Model

	V	Power	pf
Open-Circuit Test	V1 = 13.2kV	60 W	0.02
Short-Circuit Test	V2 = 40V	15 W	0.99

For the utility grid on the back of the page....

2) Convert the voltages and impeances to the 120V node (right side)

3) Write the voltage node equations for this circuit (with transformers removed)

4) Determine the voltages at each node

5) Determine the efficiency of this system
 • Ignoring the core losses
   - Assumes a large number of customers share these losses
 • Including the core losses
   - Assumes a single customer

214
1000km

238kV

j300k

10M

238kV : 13.2kV

1.07
5km

j10k

j40k

13.2kV : 120V

0.01704
80m

0.72

238kV Transmission Line

Transformer

13.2kV Transmission Lines

Transformer

Residential: 120V

20kW Load

Coal plants

Minneapolis

Subdivision

Vo

V1

V2

V3

R01

R1

jX1

R12

R2

jX2

R23

R3