ECE 201 – LAB 4
CIRCUIT ANALYSIS & DESIGN

BEFORE YOU BEGIN

EXPECTED KNOWLEDGE

You should know how to find Thevenin and Norton equivalent circuits, how to calculate maximum power transfer, and how to perform source transformations.

PREREQUISITE LABS

• Introduction to Lab Equipment
• Resistive Circuits

EQUIPMENT

• “Black Box”
• Dependent Voltage Source
• Digital Multimeter
• Programmable Power Supply

MATERIALS

• Full Set of Resistors
• Potentiometers: 100 kΩ, 10 kΩ

OBJECTIVES

After completing this lab you should be able to

• find Thevenin and Norton equivalent circuits based on measurements and calculations from practical circuits
• select proper load values to obtain maximum power transfer

INTRODUCTION

In practice it is often useful to model the behavior of two terminals in a circuit. For resistive circuits, this behavior can be modeled as a single power source (either voltage or current) and a resistor. This simple model can then be used to predict the behavior of the circuit when various loads are connected to the terminals. This method enables you to circumvent the analysis of complicated circuits by using simple models.

PRELAB

Answer Questions 1 – 2.
Construct Circuit A, substituting your calculated resistance for $R_1$.

Construct Circuit B. The dependent power source will be supplied by your T.A.

**THEVENIN AND NORTON EQUIVALENTS**

Obtain a “black box” from your TA. The box contains a resistive circuit which you will be modeling using Thevenin and Norton equivalents. Connect the input terminals of the black box to 10 volts as in Figure 3.

INTERFACE CIRCUIT DESIGN

Resistors can be used to transfer power between two independent circuits of different voltages. For example, many cellular phones come with a “car adapter.” This adapter allows you to charge the phone from a cigarette lighter. In this case, power is transferred from your car’s power system to the cell phone’s power system. Resistors are used to limit the current entering the phone.

Answer Questions 14 – 18.

MAXIMUM POWER TRANSFER

Obtain one of the black boxes that you analyzed earlier from your TA. Connect 10 volts to the input terminals and a 10 kΩ potentiometer to the output terminals. Adjust the potentiometer to its minimum resistance.

Answer Questions 19 – 21.

MAXIMUM POWER TRANSFER WITH DEPENDENT SOURCES

Obtain a dependent power supply from you TA. Connect +15 V, 0 V, and –15 V to the power terminals as labeled. Connect +15 V to Figure 2 that you constructed during the Prelab. Adjust the potentiometer in this circuit to its minimum value.

Answer Questions 22 – 25.