Electronics: ECE 3355

**Homework 2**

Sedra and Smith, 8th Ed., Chapter 1: Problems 1.48, 1.49, 1.52, 1.53, D1.55, 1.60, 1.62

From handout below: Problems E2.1, E2.2, E2.3, E2.4

E2.1. A compact disc (CD) player laser pick-up provides a signal output of 10[mV]pp and has an output resistance of 10[k]. The pick-up is to be connected to a speaker whose equivalent resistance is 8[].

1. Calculate the voltage that would be delivered to the speaker if the speaker were connected directly to the pick-up.
2. Assume that the speaker needs 20[V]pp to deliver clear acoustical output. Design an equivalent circuit for an amplifier that would deliver this output when connected between the pick-up and the speaker.

E2.2. An amplifier has been connected as shown below, with a signal source and a load connected. In addition, a dc voltage source (*VF*) and a resistor (*RF*) have been attached to provide feedback. Find the input resistance seen by the signal source with the feedback in place.



E2.3. A device, shown in Figure 3.1, can be modeled by a current source in parallel with a resistance. The relationship between the current through the device, *iX*, and the voltage across the device, *vX*, is given in the plot in Figure 3.2.

1. Find a model for the device that would be valid when current is in the range
1[mA] < *iX* < 5[mA]. This model must have numerical values for the current and resistance, and the polarities with respect to *vX* and *iX* should be shown in a diagram.
2. A voltage source is applied across the device so that *vX*  = 10[V]. Find the power delivered by the device in this situation.

Remember to use lower-case variables for voltage and current.



E2.4. A circuit is shown in Figure 4.1. The equivalent circuits for amplifiers A, B, and C, in this circuit are shown in Figures 4.2, 4.3, and 4.4, respectively. Find and draw a single amplifier equivalent circuit that could be used to replace amplifiers A, B, and C.



  

Selected Numerical Solutions to the similar problems that were in the 7th Edition of Sedra and Smith. There is no guarantee that these solutions are the same now, with the new 8th Edition. Be careful. These solutions are provided for what they are worth.

1.43 a) 82.64 = 38.34[dB]; b) 25 = 27.96[dB]; c) 826.4 x 10-3 = -1.656[dB]

1.44 38.42[dB]; 71.43[dB]; 84.9[mVrms]; 100[mW]

1.47 52.8[dB] vs 57.4[dB]

1.48 SABL

1.58 *Ri/(1+Rigm)*

E2.1. There are many possible solutions. One possible solution would be a transconductance amplifier with *Gmsc* = 900[S]; *Ri* = 10[k]; *Ro* = 10[]

E2.2. –43[]

E2.3. a) The solution is a Norton equivalent. The sign of the current source depends on the reference polarity chosen, but the magnitude is 25[mA]. The resistance is –250[].
b) *pDEL,DEV* = -2[mW].

E2.4. Transresistance amplifier, with *RIN* = 0, *ROUT* = 0, and *RMOC* = ‑117[].