

## EE321 – Fall 2002

## Homework 10

Due November 4, 2002

1. Problem 4.66.
2. Problem 4.70.
3. Problem 4.73.
4. Problem 4.78.
5. Problem 4.85.
6. Consider the two-stage common-emitter amplifier shown below. The input is a microphone with a source resistance of  $10\text{ k}\Omega$ . The amplitude of the input signal is  $20\text{ mV}$ . The output should drive the  $2\text{ k}\Omega$  load resistor  $R_L$  with an amplitude of about  $4\text{ V}$ . Choose appropriate values of resistors to finish the circuit. (Use standard values of 5% resistors from Appendix H of Sedra and Smith.) When done, find the gain of the circuit if  $\beta$  of both transistors is 100, and if  $\beta$  of both transistors is 200.

Hint: For the small-signal analysis, consider the two stages separately. The source resistance for the first stage is the  $10\text{ k}\Omega$  of the microphone, and the load resistance for the first stage is the input resistance  $R_{i2}$  of the second stage. The source resistance for the second stage is the output resistance  $R_{o1}$  of the first stage, and the load resistance of the second stage is  $R_L$ . Make the gain of the first stage about 10, and the gain of the second stage about 20. Make sure  $V_{C2}$  is at least  $3\text{ V}$  below  $V_{E2}$  to accommodate the swing in the output voltage. The analysis on Pages 285 through 288 shows how to find  $A_v$ ,  $R_i$  and  $R_o$  for a common emitter amplifier with a resistance in the emitter.

