ECE 3113: Introduction to RF Circuit Design
Homework 5

Due: Monday, September 30, 2019 in class.

Grading: Solutions must be legible and please show all work to receive full credit.

1. Page 201, Problem 4.23.


3. Page 417, Problem 7.12. Before tackling this problem you should review pp. 376 – 382 in our book, with special emphasis on p. 381. When you code the $h_{fe}$ versus frequency response, use the frequency range from 10MHz to 10 GHz on a log scale.

4. Page 480. Problem 8.3. Use the Smith Chart. Determine component values for only one topology.

5. Page 480, Problem 8.4.

**Design Project**

Your task is to design a low pass filter (topology should comply with Fig. 5-17 (a)) with 3dB cut-off frequency at 200MHz. The design constraints stipulate that the pass-band ripple be at most 3dB and the insertion loss at 250 MHz be approximately 30dB.

- a) What filter order is required?
- b) What standard normalized filter coefficients are needed?
- c) What L and C values are required if the filter is to be inserted into a 50 $\Omega$ transmission line?
- d) Use ADS and plot the voltage gain $S(2,1)$ in dB from 10MHz to 500MHz. Next plot $S(1,1)$ in the Smith Chart. Comment on your observations.
- e) You now have to convert this LP filter into a HP with the same cut-off frequency. How would you go about the conversion?