

1. [50 points] (MOS amplifier)

Use the circuit shown in Fig. P4.77 of p. 370 but rather than using the transistor model parameters of problem 4.77 use the transistor model for the NMOS of the 4007 package (with the source tied to the bulk)

- a) Calculate via appropriate formulas the Q point (check if the transistor is in saturation or not and submit the formulas used with your calculations). Check by a Spice run.
- b) Find the pi-equivalent circuit for the transistor and from that the Y matrix for the low-frequency 2-port seen by the source (of vsig & Rsig) and load (of the 10K resistor at vo). Use this to find the low frequency small signal gain vo/vsig.

2. [50 points] (BJT amplifier)

The 2N3904 is used as the transistor in Fig. 5.40 (a).

- a) Calculate using appropriate formulas the Q point (give the formulas and calculations in orderly form in your submission). Check the result by running Spice.
- b) Give the pi-equivalent circuit for the 2N3904 at this Q point.
- c) Repeat a) and b) but using the 2N3906 (note that the emitter should be at the top in this case).