

303/303H Fall 2017 – Homework 1 Due Tu 09/12/17

Note: The 1N4007 diode Spice model is on the course web page and copied here as:

```
.MODEL D1n4007 d
+IS=7.02767e-09 RS=0.0341512 N=1.80803 EG=1.05743
+XTI=5 BV=1000 IBV=5e-08 CJO=1e-11
+VJ=0.7 M=0.5 FC=0.5 TT=1e-07
+KF=0 AF=1
```

1. (40 points, Diode DC curves).

- In Spice use a Breakout diode with the above model and do a DC run to get the DC diode curves of i_D versus v_D for the 1N4007 diode, submitting your curve. Run the curves over the diode voltage $-0.8V$ to $+0.8V$
- Repeat the curves for the pnp transistor 2N3906 formed into a diode by connecting the collector to the base.
- Repeat part b) but with the diode formed by connecting the emitter to the base.
- Comment on differences and why they come about.

2. (60 points, Diode biasing and ac & transient analysis).

For the following circuit assume that the diode is a 1N4007 working at room temperature.

- For this circuit calculate by hand the bias point (= Q point) current and voltage of the diode.
- Determine (also by hand) the small signal gain of the circuit $v_o(s)/v_i(s)$, first with symbols (r_d , R_1 , L , R_L) and then with numerical values.
- Set up the circuit in Spice and: b1) check the simulated Q point, then b2) do a magnitude frequency response (=AC run) from 1Hz to 1MEG Hz.
- Comment upon your simulation results versus your hand calculation.

