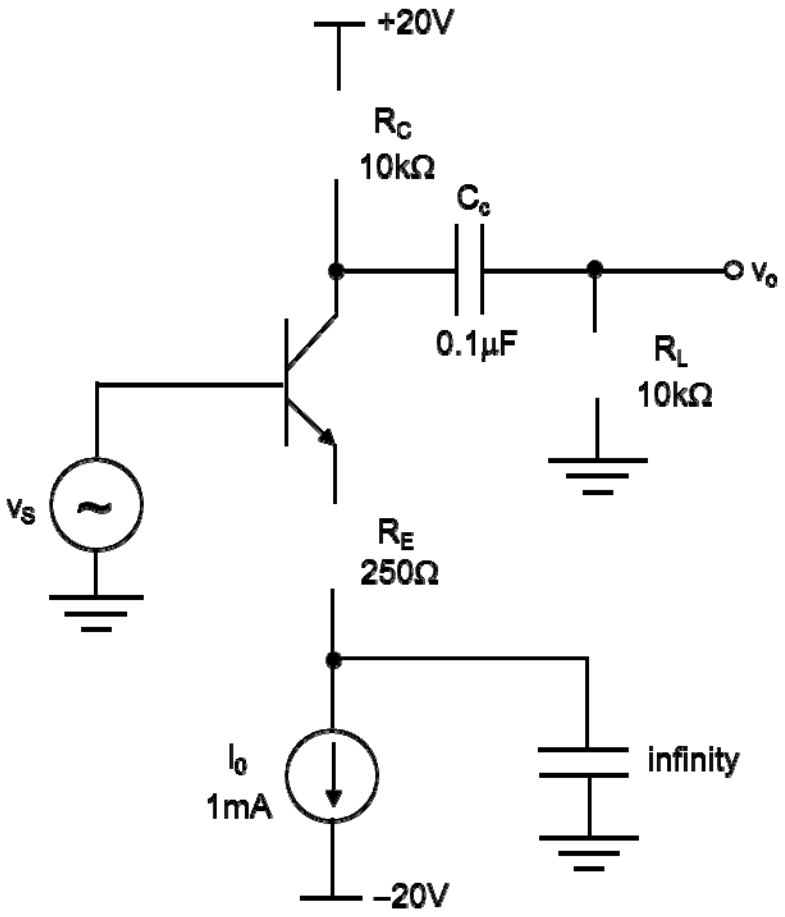
The University of Portland
Donald P. Shiley School of Engineering

EE352 Electronic Circuits II
Optional Extra Credit Homework

Assigned:	Mon, April 13, 2020
Due:	Mon, April 20, 2020, midnight as a pdf attachment
Final Exam:	Tues, April 28, 2020, 8am to 10am (open-book, open-notes, calculator, three crib-sheets, Diff Amp sheet, Calculator sheet)

Problem: (no partial credit; total points added to your homework 8 grade):

Consider the following BJT CE Amplifier with emitter-degeneracy. Assume β=100, $V_{BE\text{-}on}$=0.7V, C_π=20pF, C_μ=2pF, r_o=infinity, and V_T=25mV. For simplicity, you may assume that $\tau_{C_\pi}=R_{C_\pi}C_\pi=0$ in part h below.



a) **(5 points)** DC Analysis: Calculate I_C, V_E, and V_C. (**Note:** please make reasonable approximations when doing these calculations).

b) **(5 points)** Neatly sketch the full AC SS model (including the Hybrid-Pi model, etc, as usual).

c) **(5 points)** AC Midband Analysis: Calculate A_M.

d) **(5 points)** Using your A_M expression from part c above, what does your A_M expression become as $\beta \rightarrow$ infinity? (Isn't this a really neat result?)

e) **(5 points)** AC Midband Analysis: Calculate R_{in}.

f) **(5 points)** AC Midband Analysis: Calculate R_{out} (looking back into the circuit before R_L).

g) **(5 points)** AC Low Frequency Analysis: Calculate ω_L using SCTC's.

h) **(5 points)** AC High Frequency Analysis: Calculate ω_H using OCTC's. (Remember, for simplicity, you may assume that $\tau_{C\pi}=R_{C\pi}C_\pi=0$).

i) **(5 points)** Calculate the f_T of the BJT.

j) **(50 points)** Simulate the circuit in PSPICE using AC Sweep Analysis. Set C_e to 100μF. Use the following model parameters for your QBREAKN3: BF=100, TF=500pS, CJC=2pF, CJE=0, MJC=0, MJE=0. Hand in properly annotated PSPICE schematic, .out file, and AC Sweep output. In your PSPICE schematic, .out file or AC Sweep output graph, please highlight the following: I_C, V_E, V_C, A_M, f_L, f_H, g_m, r_π, r_0, C_π, C_μ and f_T, and compare to your hand calculations above.