EE 320 – *Electronics I*

Homework #14

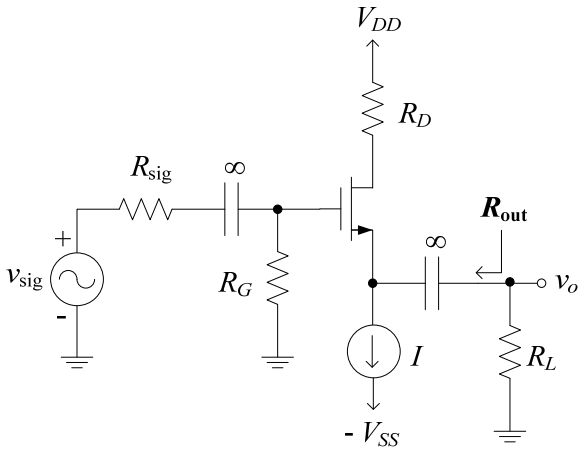
10 points

Date Assigned: 11/27	*Date Due*: 12/4

14.1 Text problem 7.120

14.2 Text problem 7.121 Parts (d) and (e) only.

14.3 Determine an algebraic expression for the small-signal AC output resistance R_{out} of the amplifier shown below. What is the value of R_{out} for the component values used in Example N36.1 in the notes? Comment on the efficacy of the bypass capacitor used in Example N36.1.



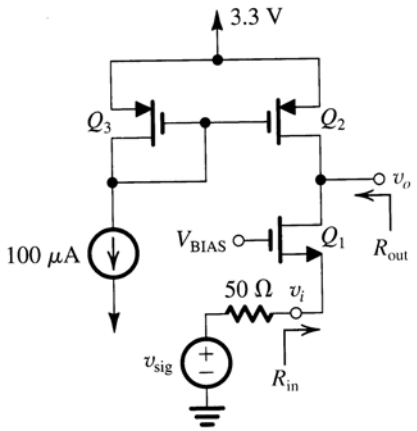
14.4 Consider a CG amplifier for which $k_n' = 160$ μA/V^2, $\lambda = 0.1$ V^{-1}, $W/L = 50$ μm/0.5 μm, $\chi = 0.2$, $I = 0.5$ mA, and $R_L = R_{sig} = r_o$. Calculate g_m, g_{mb}, r_o, R_{out}, R_{in}, A_v, and G_v. If the amplifier is instead fed by a current source i_{sig} having a source (Norton) impedance $R_{sig} = r_o$, calculate G_i.

14.5 In the CG amplifier shown below, Q_2 and Q_3 are matched, $k_n'(W/L)_n = k_p'(W/L)_p = 4$ mA/V^2, and all transistors have $|V_t| = 0.8$ V and $|V_A| = 20$ V. Transistor Q_1 has $\chi = 0.2$. The input v_{sig} is a small sinusoidal signal with no DC component.

(a) Neglecting the effects of V_A, calculate the DC drain current of Q_1 and the required value of V_{BIAS}.

(b) Determine the values of g_{m1}, g_{mb1}, and r_o for all transistors.

(c) Determine the value of R_{in}.
(d) Determine the value of R_{out}.
(e) Calculate the voltage gains A_v and G_v.
(f) Calculate how large v_{sig} can be (peak-to-peak) while maintaining saturation mode operation for Q_1 and Q_2.



14.6 Text problem 14.24

14.7 Text exercise 14.6

14.8 Text exercise 14.7

14.9 Text problem 14.31