Assignment-1	EE204 - Analog Circuits	21th Jan 2019
Submission Deadline-17.00 28th Jan, 2019.	Submission Protocol: Drop notebook in hardcopy and code and plots in Moodel	Comment: Partial

1. (a) Find out the peak transconductance (g_m) for the MOSFET (TSMC Spice Model shared with you) at V_{DS} = 5 V. (Use SPICE)
   (b) What is the corresponding V_{GS} for the same? (Using SPICE)
   (c) Find out the intrinsic output resistance (r_0) for the same MOSFET for V_{GS} found in (b). (Use SPICE)
   (d) Draw the small signal equivalent circuit for the MOSFET when V_{DS} = 3 V and V_{GS} found above.
   (e) Analytically design a regular class-A amplifier (without blocking and de-coupling capacitor) using the small signal equivalent circuit derived in (c) for an open circuit voltage gain of A_v = 2. Find out all the parameters for the circuit e.g. V_{DD}, V_{GG}, R_D. Find out the output impedance of the amplifier w/ and w/o R_D.
   (f) Re-design the same circuit in (d) using a single source V_{DD} = 5 V and using R_1-R_2 potential divider network. Assuming the input blocking capacitance in infinite ($C_B = \infty$).
   (g) Find out the gain for the amplifier at 1 MHz and 1mHz in (e) if an additional load resistance R_L = 10 kΩ is connected at the output with a decoupling capacitor of 1 μF.

2. Assume k' = 2 mA/V^2, V_{DD} = 15 V and λ = 0.01 V^{-1}.

(a) Design a CS amplifier along with biasing circuit for gain -10 with minimum allowed output impedance. You can choose an appropriate biasing circuit based on your requirement.

(b) Design a CD amplifier along with biasing circuit such that the gain is 0.9 and minimum allowed output impedance. You can choose an appropriate biasing circuit based on your requirement.

(c) Design a CG amplifier with current gain 0.8 with maximum output impedance. You can choose an appropriate biasing circuit based on your requirement.

   Simulate the circuits in (a), (b) and (c) and validate your results.

(d) Cascade the CS and CD amplifier you designed earlier with appropriate coupling capacitor. Find out the overall gain and output impedance of your amplifier.