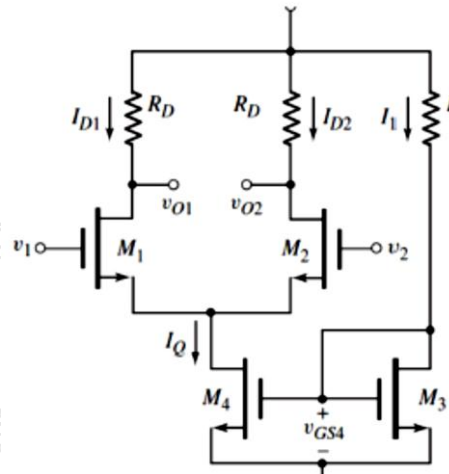


Duration: 3hrs

[Max Marks: 80]

- N.B. : (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) All questions carry equal marks.
 (4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
 - a Justify. MOSFET can be used as constant current source
 - b What skin effect in inductor modeling
 - c Prove that for basic current source $I_o = \frac{W/L_2}{W/L_1} I_{ref}$
 - d Explain diode connected in brief
 - e Compare single ended and differential power amplifiers
- 2 a For common gate amplifier prove that input resistance is equal to $R_{in} = \frac{r_o + R_L}{1 + g_m r_o}$ [12]
 and output resistance is $R_{out} = r_o + (1 + g_m r_o) R_s$
 b Explain DC analysis of MOSFET active load circuit with proper diagram [08]
- 3 a Explain PMOS fabrication process with suitable diagrams. [10]
 b Explain with proper diagram CLASS A power amplifier [10]
- 4 a Derive equation of CMRR For MOS Differential amplifier with active load and note down advantages of active load [10]
 b Derive equation for DC characteristics of MOS differential amplifier with neat and clean diagram. [10]
- 5 a Design an NMOS current source to provide a bias current of $I_Q = 100 \mu A$ and an output resistance greater than 20 MOhm. The reference current is to be $I_{ref} = 150 \mu A$. The circuit is to be biased at $\pm 3.3V$ and the voltage at the drain of the current source transistor is to be no smaller than $-2.2V$. The minimum width to length ratio of transistor is to be unity. [10]
 b Consider the differential amplifier in Figure 1. The transistor parameters are given in $K_{n3} = K_{n4} = 100 \mu A/V^2$ and $K_{n1} = K_{n2} = 50 \mu A/V^2$, except that $\lambda = 0.02 V^{-1}$ for M_3 and M_4 . Determine the differential voltage gain $A_d = v_{o2}/v_d$, the common-mode gain $A_{cm} = v_{o2}/v_{cm}$, and the $CMRR_{dB}$. [10]



- 6 a Write short notes on any of 3
- a. Short channel effects in MOSFET
 - b. Fabrication of Transformers
 - c. Fabrication of Varactors
 - d. General considerations in power amplifier

[20]
