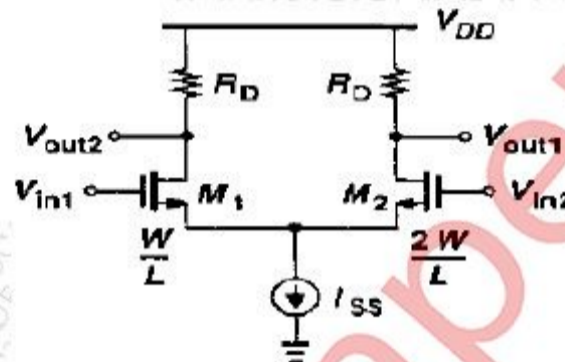[Time: 3 Hours] [Total Marks: 80]

Note: 1) Question ONE is compulsory

2) Solve any THREE out of remaining questions

3) Draw neat and clean diagrams, wherever necessary

4) Assume suitable data, if required

1 (a) Analyze following circuit to get voltage gain equation if M2 is twice wide as that   5
of M1 and Vin1=Vin2

(b) Explain importance of Miller Theorem   5

(c) List the non-ideal effects in Charged Pump circuit and justify how it impacts the   5
PLL performance

(d) With the help of suitable circuit diagram, **Justify True or false**: Cascode current   5
mirror current matching performance is better than Basic current mirror.

2 (a) Derive expression for Voltage gain Av and output resistance Ro of Source   10
follower stage.

(b) Explain in detail how to generate temperature independent references.   10

3 (a) Explain the concept of clock feed through in Charged Pump , Charge injection   10
Charge Sharing in Charged Pump

(b) Explain the concept of switched capacitor circuit. Draw and explain discrete time   10
integrator along with the output waveform

4 (a) Explain common mode response of differential pair with necessary derivations   10

(b) Explain White & Flicker noise in MOSFET. Derive equation for output and input   10
referred noise voltage of CS stage

TURN OVER

5   Design two stage Operational Transconductance Amplifier (OTA) to meet   20
     following specifications-.

     $A_v > 4000$ V/V , $V_{DD} = 2.5$V, $V_{SS} = -2.5$V   GBW = 6MHz, $C_L = 10$pF,

     SR > 10V/μs, 60° phase margin, $-2V \leq V_{out}$ range$\leq 2V$,

     ICMR = -1.125V to 2V, $P_{diss} \leq 2.5$mW

     Use, $K_{N'} = 110$μA/V^2, $K_{P'} = 50$μA/V^2, $V_{TN} = |V_{TP}| = 0.7$V, $\lambda_N = 0.04$V^{-1},

     $\lambda_P = 0.05$V^{-1}, $C_{ox} = 2.47$fF/μm^2. Verify that the designed circuit meets required
     Voltage Gain and Power   Dissipation specifications.

6   (a) Give comparison between Full-custom and Semi-custom design   5

     (b) Compare various opamp topologies   5

     (c) Compare the performance of Ring and LC oscillators in terms of phase noise,   5
          area, Q factor and application.

     (d) Derive the expression of input referred noise voltage of common source stage   5

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