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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
Second Semester, M. Tech - Electronics and Communication Engineering (VLSI)
Semester End Examination; June - 2016
Design of Analog and Mixed Mode VLSI Circuits

Time: 3 hrs   *Max. Marks: 100*

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

1 a. Derive the expression for I_D of a MOS transistor starting from the basics and hence obtain the expressions for I_D when the device operates in,

(i) Triode region

(ii) Saturation region.   10

b. Discuss the second order effects in a MOS device.   10

2 a. Obtain the expression for voltage gain of CS amplifier using small signal analysis for the following loads :

(i) Resistive load, R_D 10

(ii) Diode connected load

(iii) Current source load.

b. Obtain the expression for input impedance of CG stage taking channel length modulation and body effect into consideration.   10

UNIT - II

3 a. For a basic differential pair, show that under equilibrium,

$$|A_v| = \sqrt{\mu_c C_{ox} [W/L] I_{SS} R_D}$$ 10

b. For an active current mirror processing a signal obtains the expressions for R_{out} and A_v. Explain how the drain currents of M_1 and M_2 are combined?   10

4 a. Explain the operation of cascode current mirror and also discuss how gate voltage bias is generated?   10

b. Discuss the common mode response of differential pair :

(i) In the presence of resistor mismatch   10

(ii) With finite tail capacitance.

UNIT - III

5 a. For a source follower, using its high frequency equivalent circuit, obtain the expression for $V_{out}(s)/v_{in}(s)$ and hence obtain the expression for significant pole.   10

   b. For a common source stage obtain the expressions for $V_{out}(s)/V_{in}(s)$ and the pole frequencies.   10

6 a. Discuss the high frequency response of cascode stage.   10

   b. For a differential pair, using its high frequency model obtain the expression for $\dfrac{V_O(s)}{V_i(s)}$.   10

UNIT - IV

7 a. Explain the operation of single stage folded cascode Op-Amp.   10

   b. What is gain boosting? Explain how gain boosting is done in a differential cascode stage?   10

8 a. Discuss the Response of linear Op-Amp to step input.   10

   b. Discuss the compensation in a two-state Op-Amp.   10

UNIT - V

9 a. For a Colpitts oscillator obtain the expressions for,

   (i) Frequency of oscillations   10

   (ii) Min gains for sustained oscillations.

   b. Develop the linear model of Type-I PLL and discuss its step response.   10

10 a. For a unity gain switched capacitor amplifier, obtain the expression for,

   $\dfrac{V_{Out}(s)}{V_{in}(s)}$ and hence obtain the expression for its time constant.   10

   b. Discuss the methods of generating temperature independent reference voltage.   10

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