M.E. DEGREE EXAMINATIONS: MAY / JUNE 2010

Second Semester

APPLIED ELECTRONICS

ANE504: Analysis and Design of Analog Integrated Circuits

Time: Three Hours   **Maximum Marks: 100**

Answer All the Questions:-

PART A (10 x 2 = 20 Marks)

1. What is tunneling?

2. Define emitter injection efficiency.

3. Draw the schematic of a simple bipolar current mirror.

4. What is bootstrap? Where it is used?

5. Define Common-Mode Rejection Ratio.

6. What is superbeta transistor?

7. What are the advantages of MOS technology?

8. What is a telescopic-cascode operational amplifier? Mention any one advantage of the same.

9. Define Lock range and Capture range of a PLL.

10. Define noise spectral density.

PART B (5 x 16 = 80 Marks)

11. (a) (i) Derive an expression for the depletion region of a P-N junction.   (8)

     (ii) An abrupt PN junction in silicon has doping densities $N_A = 10^{15}$ atoms/cm^3 and $N_D = 10^{16}$ atoms/cm^3. Calculate the junction built-in potential, the depletion-layer depths and the maximum field with 10V reverse bias.   (8)

(OR)

   (b) (i) Derive the general form of Ebers-Moll equations for a npn transistor.   (8)

     (ii) Explain the short-channel effects in MOS transistors.   (8)

12. (a) (i) With Schematic, explain the Bipolar Cascode current mirror and its I-V characteristics.(12)

  (ii) Find the output resistance of the double-cascode current mirror. Assume all the transistors operate in the active region with $I_D = 10\mu A$, $V_A = 50V$ and $g_m r_o = 50$ (Neglect body effect) (4)

(OR)

(b) Explain in detail Wilson Current mirror and derive an expression for its output resistance R_o.

13. (a) Explain in detail the most important deviations from ideality in practical operational amplifiers and their effects in applications.

(OR)

(b) Discuss in detail the dc analysis of 741 operational amplifiers.

14. (a) (i) With schematic explain the Widlar current source. (8)

  (ii) Explain the MOS folded Cascode operational amplifer and its advantages. (8)

(OR)

(b) (i) Explain the basic two-stage MOS operational Aamplifiers. (8)

  (ii) With schematic explain the MOS high –swing current mirror. (8)

15. (a) With DC analysis, explain the use of Gilbert Cell as an analog Multiplier. Also derive a complete four-quadrant multiplier and explain its characteristics.

(OR)

(b) With block diagram explain the operation of a PLL and derive the closed loop transfer function for the first order loop.

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