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**B.E. / B.TECH (FULL TIME) DEGREE ARREAR EXAMINATIONS, NOV./ DEC. 2012**  
**ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH**  
**EIGHTH SEMESTER R-2008**  
**EC 9044 - RF MICROELECTRONICS**

68

Time: 3 Hours

Answer ALL Questions

Max.marks: 100

**Part-A (10x2=20 Marks)**

- 1 Define skin effect and skin depth.
- 2 Draw the equivalent circuit of an on-chip inductor at Radio Frequencies.
- 3 For short channel MOSFETs, on what factors  $\omega_T$  depends.
- 4 What are  $f_T$  doublers.
- 5 Briefly explain how phase margin and gain margin are used in stability criteria for feedback systems.
- 6 What are the compensation techniques that are used to improve the stability of feedback systems.
- 7 Draw the noise model of a MOSFET.
- 8 Define the term 'Conversion Gain' of a mixer.
- 9 How ring oscillators (controllable) as VCOs in ICs are different from other ring oscillators (uncontrolled).
- 10 Briefly explain reciprocal mixing in a superheterodyne receiver due to phase noise of local oscillator.

**Part-B (5x16=80 Marks)**

- 11.(i) With the equivalent circuit, briefly explain the monolithic realization of RF transformers. (8)
  - (ii) Compare the three transmission lines used at RF (coaxial, stripline and microstrip). (8)
  - 12.(a) For a long channel MOSFET, derive expressions for the drain current in the linear and saturation regions.
- OR**
- 12.(b)(i) Explain how open circuit time constants are used for bandwidth estimation. (10)
  - (ii) Briefly discuss how zeros are used for bandwidth enhancement in high frequency amplifier design. (6)

- 13.(a) Briefly discuss how Miller effect due to device capacitance affects the performance of RF tuned amplifiers. With circuit diagrams, explain how unilateralization and neutralization techniques (one each) are used to overcome the effects of device capacitance.

**OR**

- 13.(b)(i) With circuit diagram and waveforms explain Class F RF power amplifier. (10)  
(ii) Define the terms : Drain Efficiency, Normalized Power output capability, Power Added Efficiency. (6)

- 14.(a)(i) Discuss how inductive source degeneration technique contributes to the LNA design. With the circuit diagram briefly discuss how the design considerations are satisfied in the single ended LNA architecture. (10)

- (ii) Illustrate with necessary figure, the meaning of HP3 and Spurious Free Dynamic Range (SFDR). (6)

**OR**

- 14.(b)(i) What are the drawbacks of square-law mixers. How they are overcome in multiplier – based mixers. (4)

- (ii) Explain with necessary diagrams, the multiplier based single balanced mixer. (12)

- 15.(a) (i) With necessary diagrams, explain one type of phase detector used in PLL. (8)

- (ii) Briefly explain how a charge pump provides loop filter action for PLL. (8)

**OR**

- 15.(b)(i) With the linearized PLL model, derive an expression for the steady state phase error for the first order PLL. (10)

- (ii) Compare the second order PLL with that of first order PLL. (6)

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