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Question Paper Code: 12075

M.E. DEGREE EXAMINATION, DECEMBER 2013.

First Semester

VLSI Design

01PVL104 - SOLID STATE DEVICE MODELING AND SIMULATION

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Give the requirements for MOSFET modeling for RF applications.
2. Illustrate the different capacitance components in a MOSFET.
3. What are the various noise sources in a MOSFET?
4. What is meant by digital characterization?
5. What is the significance of BSIM4 model?
6. Draw the channel charge model of MOSFET.
7. What are the features of EKV model?
8. What are the effects of temperature on MOSFET models?
9. Write the equation to model a polysilicon resistor.
10. What are interdie and intradie variations / mismatch?

PART - B (5 x 14 = 70 Marks)

11. (a) Discuss in detail the HF behavior of MOSFET and modeling of extrinsic components like R_a, R_s, R_D and parasitic capacitances. (14)

Or

(b) Discuss in detail about the various MOSFET models and compare them. (14)
(i) Simple charge control Model
(ii) Meyer Model
(iii) Velocity saturation Model.

12. (a) Give an explanation on physical mechanism of Flicker noise and the Flicker noise models. (14)

Or

(b) Analyse the nonlinearities in CMOS devices and illustrate the modeling requirements for accurate analysis of distortion effects. (14)

13. (a) Discuss in detail (i) intrinsic and (ii) fringing / overlap capacitance Models of MOSFET. (14)

Or

(b) (i) With neat diagram, write about the enhanced model for effective DC and AC channel length and width. (7)

(ii) Discuss about Gate Electrode and Intrinsic – input resistance (IIR) model of MOSFET. (7)

14. (a) Discuss in detail how core long – channel drain current model is modified due to second order effects like mobility degradation, channel – length modulation, charge sharing and reverse short – channel effects. (14)

Or

(b) Discuss in detail the unified MOSFET I-V Model with necessary diagrams. (14)

15. a) Discuss the influence of LPVM on resistors , capacitors and MOS transistors. (14)

Or

(b) Give a detailed explanation of statistical modeling of LPVM of resistors, capacitors and MOS transistors. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Discuss in detail the important methods employed to calculate distortion in analog CMOS circuits. (10)

Or

(b) Derive expressions for the drain – source current model in MM9. (10)