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Question Paper Code: 41274

M.E. DEGREE EXAMINATION, DECEMBER 2014.

First Semester

VLSI Design

14PVL104 – SOLID STATE DEVICES MODELING AND SIMULATION

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (5 x 1 = 5 Marks)

- In a Silicon MOSrET, the gate contact is separated from _____ by an insulating silicon dioxide layer (SiO_2).
(a) the channel (b) the gate (c) the drain (d) the source
- Which is the high frequency noise _____
(a) White Noise (b) Thermal Noise (c) Flicker Noise (d) Induced Gate noise
- BSIM stands for _____
(a) Boltzmann Short-Channel IGFET Model
(b) Berkeley Short-Channel IGFET Model
(c) Boltzmann Small -Channel IGFET Model
(d) Berkeley Small -Channel IGFET Model
- The EKV model has assigned the _____ node as reference node.
(a) source (b) drain (c) bulk (d) gate
- In poly resistors, the equivalent circuit is valid at frequency up to _____
(a) 1 GHz (b) 20 GHz (c) 2 GHz (d) 10 GHz

PART - B (5 x 3 = 15 Marks)

6. Draw the equivalent circuit of MOS Transistor.
7. List out the noise sources in MOSFETs.
8. Write short notes on layout dependent parasitic model.
9. List the effects of drain current in EKV model.
10. What is process variation? How it affects the performance of a MOSFET devices?

PART - C (5 x 16 = 80 Marks)

11. (a) Give a detailed account of high frequency behavior of MOS transistor and ac small signal modeling. (16)

Or

- (b) Explain the three basic three models of MOSFETs and also derive the expression for the threshold voltage of MOSFET. (16)

12. (a) With neat Sketch, Explain the modelling of Nonlinearity in CMOS Devices. (16)

Or

- (b) Explain flicker and noise modelling. (16)

13. (a) (i) What is mobility model? Explain its working. (8)

- (ii) Discuss the modelling of Junction diode model using BSIM 4 MOSFET. (8)

Or

- (b) Explain BSIM 4 substrate model and channel charge model with suitable equations. (16)

14. (a) Explain the modelling of charge storage effects and non-quasi –static models. (16)

Or

- (b) With neat sketch, explain the operation of EKV model. (16)

15. (a) Describe the modelling of device mismatch for analog RF applications. (16)

Or

- (b) Explain Benchmark circuits for quality assurance. (16)