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BIELE-013

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

00076

June, 2016

BIELE-013 : DEVICE MODELLING FOR CIRCUIT SIMULATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Missing data may be suitably assumed. Use of scientific calculator is permitted.*

1. (a) What is SPICE ? How is it different from netlist ?

(b) Draw the small signal model of a P-N junction diode.

(c) What is the need of device modelling ?

(d) What are the parasitic capacitances that exist in MOSFETs ?

(e) What is channel length modulation in MOSFETs ? *5×2=10*

2. (a) Explain the DC current – voltage characteristics of an ideal diode.

(b) What are the limitations of an ideal diode model ? Explain in detail. *5+5=10*

3. (a) Explain the static models of an ideal diode and a real diode and its implementation in SPICE.

(b) Draw and explain the large signal model of a P-N junction diode. Give its implementation in SPICE. *5+5=10*

4. Explain how the temperature and area affects the diode model parameters implemented in SPICE. *10*

5. (a) Explain the operation principle of a BJT.

(b) Draw and explain the Ebers-Moll static model of BJTs. *5+5=10*

6. (a) Write the SPICE BJT Model parameters, with their default values and units.

(b) Explain the Base Width Effect in BJTs. *5+5=10*

7. Explain the operation principle of MOSFETs. Derive the expression of drain current in all modes of operation. Draw the characteristics of MOSFETs. *10*

8. (a) What is device scaling ? What is the difference between short and narrow channel MOSFETs ?

(b) What is charge sharing effect in MOSFET ? Explain the non-linear effects in MOSFET. *5+5=10*

9. (a) What are the MOS Models that exist for circuit simulation ?

(b) Explain Level-1, Level-2 and Level-3 large signal MOSFET models.

(c) How are model parameters extracted in MOSFETs ? *3+4+3=10*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) DIBL Effect in MOSFETs

(b) BSIM

(c) Heterojunction Devices

(d) Noise Models of BJTs