

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

**Term-End Examination**

**December, 2017**

00319

**BIELE-013 : DEVICE MODELLING FOR  
CIRCUIT SIMULATION**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. Answer the following briefly :  $5 \times 2 = 10$
- (a) Mention the principle of circuit simulation and its objectives.
  - (b) Define SPICE. How is it different from the verilog netlist of an analog circuit ?
  - (c) What is the difference between device modelling and device simulation ?
  - (d) What is body effect in MOSFET ?
  - (e) What is base width modulation of BJT ?

2. (a) Write a program using SPICE code in order to simulate a half wave rectifier circuit. Draw its input and output waveforms. 5
- (b) Mention the SPICE commands for AC, DC, transient, noise and temperature analysis of any analog circuit. 5
3. (a) How is depletion region formed in a p-n junction diode ? Derive the expression of depletion region width with respect to junction built-in potential. 5
- (b) How are different model parameters of a diode measured ? 5
4. Draw and explain various capacitances present in MOSFET. Also explain charge sharing effect in MOSFET. 10
5. (a) Describe the static model of the ideal diode and its implementation in SPICE. 5
- (b) Draw and explain the small signal model of a p-n junction diode. 5
6. Describe high frequency and noise models of a bipolar junction transistor. 10
7. Discuss the modelling of JFET and MESFET. 10

8. (a) What is meant by scaling of MOSFET ?  
What are the types of scaling ? Explain any  
one scaling technique. 5
- (b) What is channel length modulation and  
how does it affect the drain current of  
MOSFET ? 5
9. (a) Draw the small signal model of MOSFET  
and mention the SPICE parameters with  
their values and units. 5
- (b) Explain Level-1 and Level-2 large signal  
MOSFET models and write their  
advantages and disadvantages. 5
10. Write short notes on any *two* of the  
following :  $2 \times 5 = 10$
- (a) Heterojunction Devices
- (b) BSIM Model
- (c) DIBL Effect
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