| BIELE-013 |

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)
Term-End Examination

00286   **June, 2015**

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. Scientific calculator is permitted.*

1. What are the applications of SPICE ? Write down the netlist for the given circuit (Figure 1).   *10*
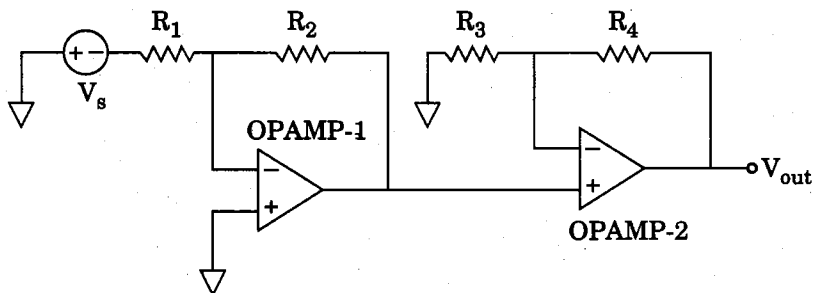

Figure 1

2. What is the basic difference between small signal and large signal models of diodes ? How are diode parameters like dynamic resistance, reverse saturation current and forward voltage drop measured ?   *10*

3. **(a)** How can model parameters of BJT be extracted ? *5*

(b) Explain the various objectives of circuit simulation. *5*

4. **(a)** Draw and explain the schematic representation of MOSFET oxide capacitance during cut-off, linear and saturation mode. *5*

(b) Explain the concept of channel length modulation in a N-channel MOSFET. *5*

5. Draw and explain the equivalent circuit structure of N-MOS level-1 model. Also write down the drain current equation for linear, saturation and cut-off region. *10*

6. The parameters of the MOSFET circuitry shown in Figure 2 are $V_{TH} = 0.8$ V, $K_n' = 80$ $\mu A/V^2$ and W/L = 3. Design the circuit such that the quiescent values are $I_D = 250$ μA and $V_D = 2.5$ V. *10*
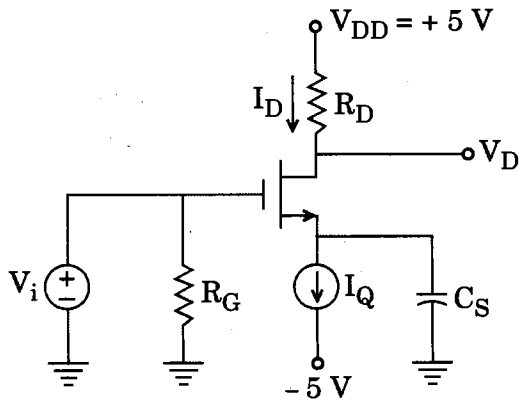

Figure 2

7. (a) Write the differences between MOSFET and BJT. 5

(b) What is charge sharing effect in MOSFET ? 5

8. Write down the characteristics of JFET. Also explain the following parameters : 10

(a) Pinch-off voltage

(b) Break-down voltage

(c) Input resistance

9. Draw and explain the energy band diagram of heterojunction devices. What is built-in voltage ? How does it affect the properties of materials ? 10

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

(a) Noise models of BJT

(b) MOS capacitances

(c) HBTs

(d) Base width modulation effect in BJT