Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18EC3028** | **Duration :** | **3hrs** |
| **Sub. Name :** | **SOLID STATE DEVICE MODELING AND SIMULATION** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **Course Outcome** | **Marks** |
| **ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)** | | | | |
| 1. | a. | Describe the current conduction in pn junction diodes. Obtain the expressions for net current density. | CO1 | 8 |
| b. | Derive the current flow in a semiconductor defined by continuity equation. | CO2 | 8 |
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| 2. | a. | Derive the expression for base transport factor and obtain the  Ebers-moll model of a semiconductor. | CO3 | 8 |
| b. | Discuss Charge Control theory and derive Small Signal Model of PN junction diode. | CO2 | 8 |
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| 3. | a. | List the different modes of operation of BJT and discuss the Ideal  IC–VCE  Characteristics. | CO3 | 8 |
| b. | Discuss the effect of collector bias variation with necessary characteristic equations and diagrams. | CO3 | 8 |
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| 4. | a. | Derive the expressions for MOS gate, oxide and flat band capacitances and obtain the MOS capacitor equivalent circuit. | CO4 | 8 |
| b. | Explain the ideal MOS capacitor structure with neat diagram and express gate voltage in terms of surface potential. | CO4 | 8 |
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| 5. | a. | Derive the drain current equation of long channel MOS Transistor using forward and reverse currents. | CO5 | 8 |
| b. | Explain the effects of channel length modulation and source drain series resistances. | CO5 | 8 |
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| 6. | a. | Briefly explain the categorization of band and bond model in a solid semiconductor. | CO1 | 8 |
| b. | Obtain the expression for surface potential master equation. | CO2 | 8 |
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| 7. | a. | Enumerate carrier injection concept in an ideal diode. | CO2 | 8 |
| b. | Derive the Pao-Sah current - voltage model of MOS transistor and brief its significance. | CO5 | 8 |
| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
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| 8. | a. | Apply constant field scaling rules to the long channel current for the linear and saturation region and prove that the device parameters were fit in to MOSFET scaling. | CO6 | 10 |
| b. | Explain the discrete dopant effect on MOSFET threshold voltage. | CO6 | 10 |