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Total No. of Pages : 02

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M.Tech.(VLSI D) EL-I (2016 & Onwards) (Sem.-2)

**SEMICONDUCTOR DEVICES**

Subject Code : MTVL-206

M.Code : 74262

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTIONS TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1.
  - a) What is the physical meaning of schrodinger's wave function? Enlist the applications of it. Discuss **any one** in detail.
  - b) State and derive the continuity equation for electrons.
2.
  - a) Describe the Hall Effect. Explain, why polarity of Hall voltage changes depending upon the type of semiconductor.
  - b) What do you understand by linearly graded junction? Discuss its function to obtain special p-n junction capacitance characteristics.
3.
  - a) Write a short note on following :
    - i) Avalanche process
    - ii) Early effect
  - b) What is the importance of Gummel - Poon model? Discuss the operation of transistor using this model.
4.
  - a) Discuss the I-V characteristics of MOSFET when biased in saturation and non-saturation region.
  - b) What do you understand by flat band voltage? Explain the charge distribution of MOS structure for flat band voltage.

5.
  - a) Enlist and describe **any five** short channel effects while obtaining higher integration density in MOSFETS.
  - b) Describe induced drain leakage using band diagram as a function of depth in region where gate overlaps the drain junction.
6.
  - a) Explain energy band diagram of MOS capacitor in accumulation and depletion region.
  - b) Explain briefly :
    - i) Work function difference for  $n^+$  polysilicon on silicon as doping is varied.
    - ii) Effects of charges in oxide.
7.
  - a) What do you mean by sub-threshold conduction? Discuss the equivalent circuit of MOS showing sub-threshold slope.
  - b) Enlist the parameters that can be determined using C-V characteristics of MOS device. Also discuss effect of temperature on C-V characteristics of MOS device with appropriate diagrams.
8. Discuss following briefly :
  - a) Punch through in MOS devices
  - b) High injection effects in BJT
  - c) Channel length modulation
  - d) Transport phenomenon in Nano devices

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**