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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH. DEGREE EXAMINATION (R), MARCH 2021
VLSI AND EMBEDDED SYSTEMS

Course Code: 20ECVET101

Course Name: VLSI TECHNOLOGY

Max. Marks: **60** **Duration:** **3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. How Electronic Grade Silicon is obtained from MGS.
2. Deduce an expression for the position of Fermi level (E_F) in an extrinsic semiconductor.
3. What is drift current. Give the expression for drift current due to electrons and holes, in a semiconductor.
4. What is Body effect in a MOSFET
5. Draw the small signal model of a MOSFET including the effect of channel length modulation.
6. What is transconductance in a MOSFET. Obtain an expression for it.
7. What is scaling? What are the advantages of scaling?
8. Explain the Gate-oxide tunneling leakage in MOSFETs.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Explain the Float-Zone method of Single crystal silicon growth from EGS, with necessary diagrams. Give its main disadvantage over Czochralsky process. (6)

OR

10. (a) Explain the optical wafer exposure systems used in lithography process. (4)

    (b) In a Proximity exposure system if the gap (g) is 10μm and an i-line light source with λ =365nm is used, (Fresnel diffraction). Find the minimum resolvable feature size? (2)

MODULE II

11. (a) Using E-K diagram, Differentiate between Direct and Indirect Semiconductors. (4)

    (b) What is effective mass (m*) of charge carriers. (2)

OR

12. Derive expressions for the electron concentration in the conduction band and hole concentration in Valence band for a semiconductor at thermal equilibrium. (6)

MODULE III

13. For a forward biased p-n junction derive an expression for the steady-state density variation of injected holes in the n-type material as a function of distance (6)

OR

14. Derive an expression for the depletion width of a one-sided (one side very heavily doped compared to the other) p-n junction (6)

MODULE IV

15. Derive an expression for threshold voltage for an ideal MOS structure and how it is getting modified in non-ideal MOS structures. (6)

OR

16. Write down the advantages of using MOSFETs as active device in VLSI design (6)

MODULE V

17. Draw the High Frequency equivalent circuit model of a MOSFET showing all the associated capacitances. Explain the different capacitances with expressions. (6)

OR

18. Draw the circuit of a common source amplifier and find out its voltage gain and output impedance by applying the small signal model of a MOSFET. (6)

MODULE VI

19. Explain the techniques of Junction isolation and Dielectric isolation used in VLSI technology. (6)

OR

20. What is velocity saturation and how it affects the operation of a MOSFET. (6)

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