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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, FEBRUARY 2016

Electronics & Communication Engineering

(VLSI & Embedded Systems)

04 EC6501—VLSI Technology

Max. Marks : 60 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks

1. A mass m is moving with velocity *v* . What is its DeBroglie Wavelength
2. What are the two major conditions to be satisfied when electrons and holes recombine.
3. For a forward biased p-n junction in which the acceptor density is N_A and the barrier voltage at the junction is V_B , write down an expression for the density of holes which will cross over from p-type to the n-type material.
4. Write down the expression for the drain current of a MOSFET and from it derive an expression for its transconductance g_m.
5. Draw the low frequency circuit model of the MOSFET including body effect.
6. Indicate one method for reducing the threshold voltage of a MOSFET.
7. Draw the energy-band diagram of an ohmic contact.
8. Write down an expression for the maximum voltage gain available from a MOSFET.

PART B

Answer all questions. Each question carries 6 marks

9. Derive an expression for the radius of curvature of an electron with charge e, velocity *v* and mass m moving normal to a uniform magnetic flux B.

OR

10. Using suitable sketches explain the float zone method of refining silicon

11. Using suitable sketches explain the process of recombination of an electron and a hole in materials with direct and indirect band gaps. Indicate the nature of emissions in each case

OR

12. Prove that the Fermi level is invariant in a quantum mechanical system at thermal and electrical equilibrium.

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.

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.

15. Write down the advantages of using MOSFETs as active device in VLSI design.

OR

16. Indicate how the threshold voltage of a MOSFET can be reduced by proper choice of gate material.

17. Indicate the method of calculating the capacitances associated with a MOSFET.

OR

18. Draw the circuit of a MOSFET source-follower and derive an expression for its gain taking the body effect also into account.

19. Explain what is velocity saturation and how it affects the frequency response of a MOSFET amplifier.

OR

20. Explain the techniques of junction isolation and dielectric isolation used in VLSI technology.