Reg. No. :

Question Paper Code : 77109

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

Electronics and Communication Engineering

EC 6201 — ELECTRONIC DEVICES

(Regulation 2013)

Time : Three hours — Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Consider a silicon pn junction at T = 300 K so that $n_i = 1.5 \times 10^{10}$ cm^{-3}. The n type doping is 1×10^{16} cm^{-3} and a forward bias of 0.60 V is applied to the pn junction. Calculate the minority hole concentration at the edge of the space charge region.

2. Sketch the forward bias characteristics of the pn junction diode.

3. What do you mean by drift current?

4. Sketch the Ebers Moll model.

5. Assume that the p+n junction of a uniformly doped silicon n channel JFET at $T = 300$ K has doping concentrations of $N_a = 10^{18}$ cm^{-3} and $N_d = 10^{16}$ cm^{-3}. Assume that the metallurgical channel thickness a is 0.7 μm. Calculate the pinch off voltage.

6. What is channel length modulation?

7. What is a MESFET?

8. Expand: LASER, LDR.

9. Sketch the V-I characteristics of an UJT.

10. "A solar cell is a pn junction device with no voltage directly applied across the junction". If it is so, how does a solar cell deliver power to a load?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the expression for drift current density. (12)

(ii) Determine the ideal reverse saturation current density in a silicon pn junction at T = 300 K. Consider the following parameters in the silicon pn junction: $N_a = N_d = 10^{16}$ cm^{-3}, $n_i = 1.5 \times 10^{10}$ cm^{-3}, $D_n = 25$ cm^2/s, $T_{p_0} = T_{n_0} = 5 \times 10^{-7}$ s, $D_p = 10$ cm^2/s, $\epsilon_r = 11.7$. Comment on the result. (4)

Or

(b) (i) Derive the expression for diffusion current density. (12)

(ii) Describe the deviation of V-I characteristics of pn junction diode from its ideal. (4)

12. (a) (i) With relevant expressions and figures, describe Early effect. (6)

(ii) Discuss the Input and Output characteristics of CE configuration. (10)

Or

(b) (i) With relevant expressions and sketch, describe h-parameter model. (6)

(ii) Describe the working of PNP junctions. (10)

13. (a) (i) Discuss the Drain and Transfer characteristics of JFETs. (10)

(ii) Explain the concept of Threshold voltage in a MOSFET. (6)

Or

(b) (i) Discuss the characteristics of MOSFET. (10)

(ii) Describe the concept of dual gate MOSFET. (6)

14. (a) (i) Consider an n-channel GaAs MESFET at T = 300 K with a gold Schottky barrier contact. Assume the barrier height is $\Phi_{B_n} = 0.89$ V. The n-channel doping is $N_d = 2 \times 10^{15}$ cm^{-3}. Determine the channel thickness such that $V_T = +0.25$ V. Also $N_c = 4.7 \times 10^{17}$ cm^{-3} and ϵ_r of GaAs = 13.1. (4)

(ii) Describe the working of metal-semiconductor junction. (12)

Or

(b) Write short notes on :

(i) Tunnel diode

(ii) Varactor diode

15. (a) Write short notes on :

(i) Power BJT

(ii) Power MOSFET

Or

(b) Write short notes on :

(i) LCD

(ii) CCD

———————