Reg.No.	

B.E/B.TECH DEGREE END SEMESTER EXAMINATION MAY-2013

6

Electronics and Communication Engineering

EC8201-ELECTRONIC DEVICES

II SEMESTER (R-2012)

Time : 3 Hours **Max. Marks:100**

Answer All Questions

Part-A **10x2=20 Marks**

1. Define drift current and diffusion current.
2. Calculate the built-in potential barrier in a silicon PN junction at T=300K with doping densities Na = $1x10^{18}cm^{-3}$ and Nd = $1x10^{15}cm^{-3}$. Assume $n_i = 1.5 \times 10^{10}cm^{-3}$
3. What is base width modulation?.
4. Draw the complete hybrid pi model of a CE transistor configuration.
5. Define channel length modulation.
6. What is the difference between JFET and MOSFET?
7. Draw the energy band structure of a metal and semiconductor junction.
8. What is the application of Varacter diode? Justify.
9. What is power MOSFET?
10. What is the significance of Dual gate MOSFET?

Part-B **16x5=80 Marks**

11 (a)(i) Explain the basic principle of operation of PN junction. (4)

(ii) Derive the expression for the electric field at the junction under reverse bias condition (4)

(iii) The maximum electric field in a reverse-biased GaAs PN junction at T=300K is to be $|E_{max}| = 2.5 \times 10^5$ V/cm. The doping concentrations are $N_d = 5 \times 10^{15}$ cm^{-3} and $N_a = 8 \times 10^{15}$ cm^{-3}. Determine the reverse - bias voltage that will produce this maximum electric field. (Relative permittivity of GaAs = 13.1) (8)

12(a)(i).Explain in detail the current relations of NPN transistor and also derive the relationship between the current gains of all the three transistor configurations. (10)

(ii) Draw and explain with relevant mathematical derivation of a h-parameter model of a CE transistor configurations. (6)

(OR)

12(b)(i) Derive the expression for Ebers Moll model of a NPN transistor. Also discuss the significance of this model. (10)

(ii)The collector-emitter saturation voltage of a bipolar transistor at T=300K.Given that α_F =0.98,α_R=0.28,and collector current 1A.Plot $V_{CE(sat)}$ versus I_B over the range $0.03 \leq I_B \leq$ 1.0A. (6)

13(a)(i)Draw and explain the basic principle of operation and V-I characteristics of a JFET. (12)

(ii) Consider a silicon p^+n junction of a uniformly doped silicon n-channel JFET at T=300K has doping concentrations of N_a=1016cm^{-3} N_d=1018cm^{-3}. Assume that the metallurgical channel thickness is 0.75μm. Determine the internal pinch-off voltage and pinch-off voltage of an n-channel JFET. (4)

(OR)

13(b)(i) Explain with relevant diagram and V-I characteristics of Enhancement- mode of a n-channel MOSFET. (12)

(ii)How is the threshold voltage modification performed by ion implantation? Explain. (4)

14 (a) (i) Describe the basic principle of operation of LASER diode. (8)

(ii) Explain the operation and V-I characteristics of Zener diode. (8)

(OR)

14(b) Explain the basic principle of operation and V-I characteristics of a Tunnel diode.

15(a) Describe with neat diagram the principle of operation of UJT.

(OR)

15(b) Write short notes on the following

(i) VMOS (4)

(ii) Opto coupler (4)

(ii) LCD (8)
