REG. NO.										

B.E./B.TECH(FULL TIME) END SEMESTER EXAMINATIONS, APRIL/MAY 2014
ELECTRONICS AND COMMUNICATION ENGINEERING
SECOND SEMESTER REGULATIONS 2012
EC8201- ELECTRONIC DEVICES

Time: 3 Hours **Answer all the questions** **Max. Marks: 100**

PART A (10 x 2 =20)

1. In a p-n junction, if the doping concentration on the n-side is larger than the doping concentration on the p-side, which side has a larger depletion width? Justify your answer.
2. A Silicon p-n junction diode, under reverse bias condition has depletion region of width $10\mu m$. The relative permittivity of Silicon $\varepsilon_r = 11.7$ and the permittivity of free space $\varepsilon_o = 8.85 * 10^{-12}\ F/m$. Find the depletion capacitance of the diode per square meter.
3. In a BJT, base current $I_B = 20\mu A$, $\alpha = 0.997$. Find the emitter current I_E.
4. What is a Multi Emitter Transistor?
5. What is Channel Length Modulation in MOSFET?
6. What is the significance of Fin-FET?
7. What is a Voltage Variable Capacitor? Specify its significance.
8. What is the advantage of Gallium Arsenide device?
9. A particular green LED emits light of wavelength $5490A^{\circ}$. Find the energy band gap of the semiconductor material used.
10. Compare DMOS and VMOS.

PART-B (5 x 16=80)

11. (i) Derive the ideal current-voltage relationship of a diode. (8)
    (ii) The cross section area of a diode operating in the forward bias region is increased by a factor of 10. Determine the change in the applied voltage V_a if the diode current is maintained constant. (4)
    (iii) A heavily doped n-type semiconductor has the following data:
    Hole-electron mobility ratio:0.4
    Doping concentration: 4.2×10^8 atoms/m^3
    Intrinsic concentration: 1.5×10^4 atoms/m^3
    Find the ratio of conductance of the n-type semiconductor to that of the intrinsic semiconductor of same material and at the same temperature. (4)

12. a) (i) Derive and explain Ebers-Moll equivalent circuit model of a Bipolar Junction Transistor. (13)
    (ii) A bipolar transistor has the following parameters:
    Common base current gain for the inverse-active mode=0.20
    Common base current gain for the forward-active mode=0.998
    Collector current=1mA
    Base current=40μA
    Calculate the collector-emitter saturation voltage. (3)

OR

b) (i) Draw the h-parameter equivalent circuit model of a bipolar transistor in a common- emitter circuit configuration. Explain the different parameters involved in the model. (8)
(ii) Discuss with neat diagrams, the input and output characteristics of a bipolar transistor in a common-base circuit configuration. (4)
(iii) Derive the transistor current equations. (4)

13. a) (i) Explain the basic principle of operation of an n-channel Junction Field Effect Transistor with transfer and drain characteristics. (12)

(ii) A 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 $N_d = 10^{16}/cm^3$. The metallurgical channel thickness, a is $0.75\mu m$. Calculate the internal pinchoff voltage and pinchoff voltage. (4)

OR

13. b) (i) Explain the basic principle of operation of an n-channel E-MOSFET with transfer and drain characteristics. (12)

(ii) Consider a D-MOSFET with threshold voltage of 400mV working in saturation. The drain current is observed to be 1mA if V_{GS}=900mV. Neglecting the channel width modulation effect and assuming that the MOSFET is operating at saturation, find the drain current if V_{GS}=1400mV. (4)

14. a) (i) Explain the operation of LASER diode. (8)
(ii) Explain in detail about Zener diode. (8)

OR

14. b) (i) Explain the principle of operation of tunnel diode with relevant energy band diagrams. (10)
(ii) Explain about Schottky barrier diode. (6)

15. a) (i) Explain the basic principle of operation and characteristics of Uni-junction Transistor with its equivalent circuit. (13)
(ii) Consider an Uni-junction Transistor with R_{B1}=3kΩ and R_{B2}=2kΩ. Calculate the intrinsic standoff ratio. (3)

OR

15. b) (i) Explain the mechanism of a Charge Coupled Device along with its main features. (8)
(ii) Explain in brief about Solar Cells. (4)
(iii) Discuss about LCDs. (4)