**B.E/B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2014**
**ELECTRONICS AND COMMUNICATION ENGINEERING (2nd SEMESTER)**
**(REGULATION 2004)**
**EC 181– ELECTRONIC DEVICES**

Time : 3 Hrs                                                                                          Max. Marks :100

Answer **ALL** Questions
**PART-A**                                                          **(10 x 2 = 20 Marks)**

1. The transition capacitance of an abrupt junction diode is 20 pF at 5 V. Compute the value of decrease in capacitance for a 1 V increase in the bias.
2. Differentiate between drift current and diffusion current.
3. What is avalanche breakdown?
4. What is meant by "heterojunction"?
5. Calculate the $\beta$ of a transistor when $\alpha$ is 0.98.
6. Define "early effect".
7. What is meant by "pinch-off" voltage?
8. Mention the operating modes of a MOSFET.
9. Mention the applications of SCR.
10. What is the need for having a heat sink?

**PART-B**                                                          **(5 x 16 = 80 Marks)**

11. A semiconductor at room temperature (300 ° K), the intrinsic carrier concentration and resistivity are $1.5 \times 10^{16}$/cm$^3$ and $2 \times 10^3 \Omega$-m respectively. It is converted to an extrinsic semiconductor with a doping concentration of $10^{20}$/ m$^3$. For the extrinsic semiconductor, calculate the
    (i) Minority carrier concentration
    (ii) Resistivity
    (iii) Shift in Fermi level due to doping
    (iv) Minority carrier concentration when its temperature is increased to a value at which the intrinsic carrier concentration "$n_i$" doubles.
    Assume the mobility of majority and minority carriers to be the same and kT=26 meV at room temperature.                                      (4+4+4+4= 16)

12.a)(i) With neat sketches, explain about the threshold voltage modification due to short and narrow channels.                                      (8)
    (ii) Use relevant diagrams to explain the structure of enhancement type MOSFETs. Why are the devices so named? Can they be operated in the depletion mode?                                      (8)
**(OR)**
12.b) With neat sketches, explain the construction, working principle, transfer and drain characteristics of a N-channel JFET.                                      (16)

13.a)(i) Draw the hybrid-$\pi$ model of a BJT and express the notations used in the model                                      (8)
    (ii) Calculate the collector-emitter saturation voltage of a BJT at T = 300° K assuming $\alpha_F$ = 0.99 ; $\alpha_R$ = 0.20; the collector and the base currents given as 1mA and 50μA respectively.                                      (8)
**(OR)**
13.b)(i) With neat sketches, briefly explain about the switching characteristics of a transistor.                                      (8)
    (ii) Draw the Gummen Pool model of a transistor and explain the notations used.                                      (8)

14.a)(i) With energy band diagram , explain the concept of tunnelling. (8)

(ii) With neat sketches, explain the forward and reverse bias characteristics of a PN junction diode. (8)

**(OR)**

14.b) With neat diagrams, explain the structure of current flow mechanisms of Metal Semiconductor junction in detail. (16)

15.a) Write a brief note on the following:

(i) Power MOSFET

(ii) Power BJT

(iii) GaAs Devices (5+5+6=16)

**(OR)**

15.b) With neat sketches, explain the working principle and the characteristics of DIAC and TRIAC. (16)