

D 30331

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Name.....

Reg. No.....

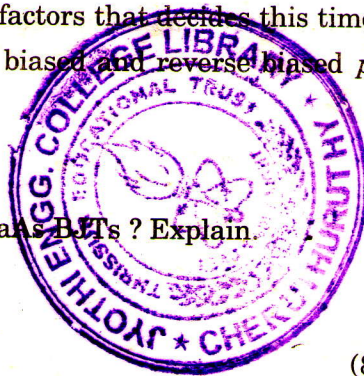
**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2003**

EC 2K 303. SOLID STATE DEVICES

Time : Three Hours

Maximum : 100 Marks

1. (a) What are intrinsic and extrinsic semiconductors ? Explain their conductivity at absolute and room temperature.
- (b) Define carrier life time. What are the various factors that decides this time ?
- (c) Draw the energy band diagram of a forward biased and reverse biased $p-n$ junctions and explain.
- (d) What is tunnelling effect ? Explain.
- (e) Explain about Kirk effect in BJTs.
- (f) What are the advantages of hetero junction GaAs BJTs ? Explain.
- (g) What is meant by strong inversion ? Explain.
- (h) Explain about GaAs MESFETs.



(8 × 5 = 40 marks)

2. (a) (i) Derive the equation for equilibrium concentration of holes in a semiconductor. (7 marks)
- (ii) Derive the equations for the Fermi level in intrinsic material. (8 marks)

Or

- (b) (i) Explain in detail about conductivity and mobility of semiconductors. (7 marks)
- (ii) Derive the current continuity equation for semiconductors. (8 marks)

3. (a) (i) What are various mechanisms that happen when a $p-n$ junction is formed ? Explain about contact potential. (8 marks)

- (ii) Derive the equation for the $p-n$ junction current components for forward bias and reverse bias case. (7 marks)

Or

- (b) (i) Explain about various breakdown mechanisms in a $p-n$ junction. (7 marks)
- (ii) Explain about Schottky barrier. What are its advantages over $p-n$ junction. (8 marks)

4. (a) (i) Explain the operation of BJT with various current components. Derive the equations for the terminal current. (8 marks)

- (ii) Explain d.c. and a.c. load line of BJTs. Explain how load lines can be drawn. (7 marks)

Or

Turn over

- (b) (i) Derive the Ebers-Moll equation and model for a BJT. (8 marks)
- (ii) Explain the operation of UJT with its equivalent circuit. What are its applications ? (7 marks)
5. (a) Explain in detail the operation of depletion mode and enhancement mode MOSFETs. Draw its V-I characteristics. (15 marks)

Or

- (b) (i) Explain in detail about MOS capacitance. (7 marks)
- (ii) Explain the short channel and substrate bias effects of MOSFET. (8 marks)

[4 × 15 = 60 marks]

