

(3 Hours)

[Total Marks : 80

- N.B. : (1) question No. 1 is **compulsary** and solve any **Three** questions from remaining questions.
(2) Assume suitable data if necessary.
(3) Draw neat and clean figures.

1. Answer any **five** :
 - (a) For the diodes, define forward voltage drop, maximum forward current, dynamic resistance, reverse saturation current & reverse breakdown voltage. 5
 - (b) Draw characteristics of Pn junction in thermal equilibrium? Explain. 5
 - (c) Define the contributing factors for the low frequency common base current gain of BJT. 5
 - (d) Define internal pinch-off voltage, pinch-off voltage & drain to source saturation voltage for JFET, 5
 - (e) What are types of MOSFET? Explain. 5
 - (f) Explain construction, working & characteristics of UJT. 5
2. (a) What is space charge width? Derive an expression for it, when the diode is forward biased and reverse biased. 10
(b) List the ideal conditions of BJT and explain the non-ideal effects. 10
3. (a) Draw Ebers - Moll equivalent circuit of BJT & derive necessary expressions for current and voltages. 10
(b) Compare BJT, JFET & MESFET. 10
- (4) (a) What is channel length modulation in MOSFET? Derive necessary expression for the same. 10
(b) Explain construction, working & characteristics of Tunnel diode - 10
5. (a) What is HBT? Explain construction & energy band diagram of the same. 10
(b) For an n-channel MOS transistor with $\mu_n = 600 \text{ cm}^2/\text{vs}$, $C_{ox} = 7 \times 10^{-8} \text{ F/cm}^2$, $W = 20 \mu\text{m}$, $L = 2 \mu\text{m}$ and $V_{TO} = 1.0\text{V}$ Examine the relationship between the drain current & terminal voltages. 10
6. Write short notes 20
 - (a) SCR
 - (b) Solar Cell
 - (c) Photo diode
 - (d) IGBT