

GUJARAT TECHNOLOGICAL UNIVERSITY**P.D.D.C. Sem- I Examination January 2010****Subject code: X11101****Date: 07 / 01 / 2010****Subject Name: Basic Electronics****Time: 11.00 am – 1.30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** Answer the following in brief
- (a) What is the difference between an intrinsic and an extrinsic semiconductor? **02**
 - (b) Prove that $\beta = \alpha / (1 - \alpha)$ for transistor. **02**
 - (c) What do you mean by Thermal Run Away of a Transistor? **02**
 - (d) Why two back to back connected diodes cannot work as a transistor? **02**
 - (e) Differentiate avalanche breakdown and zener breakdown in PN Junction. **02**
 - (f) Why the input impedance of a darlington pair is higher than that of a single stage transistor follower? **02**
 - (g) Define (i) Transconductance g_m (ii) Amplification factor μ of an FET. **02**
- Q.2**
- (a) Draw and explain the class B Push Pull amplifier circuit. **05**
 - (b) How is an FET used as a voltage variable resistance? **05**
- OR**
- (b) Give the order of magnitude and definition of g_m, r_d and μ for a MOSFET. **05**
 - (c) For an N-Channel silicon FET with a $\alpha = 3 \times 10^{-4}$ cm and $N_D = 10^{15}$ electrons/cm³ find (i) The pinchoff Voltage and (ii) The channel half width for $V_{gs} = \frac{1}{2} V_p$ and $I_D = 0$. **04**
- Q.3**
- (a) Derive the expression for DC current, load Voltage, Diode Voltage and the rms current for a full wave (Two diode) rectifier circuit. **07**
 - (b) Describe the structure and applications of Tunnel Diode. **07**
- OR**
- Q.3**
- (a) Explain the circuit of a Bridge rectifier with neat sketch. Also derive expression for DC current, load voltage, diode voltage and the rms current. **07**
 - (b) Explain the photovoltaic effect in detail. **07**
- Q.4**
- (a) Define h parameters. Draw hybrid small signal model for a transistor in CE configuration. **05**
 - (b) Write Eber's small signal equations. Explain equivalent circuit of PNP and NPN transistor based on Eber's small signal model. **05**
 - (c) State and explain miller's theorem and its duality. **04**
- OR**
- Q.4**
- (a) What is Q point of transistor amplifier? What parameter affects change in Q point of amplifier? (P.T.O.) **05**

- (b) State and explain emitter bias circuit for transistor . Derive necessary equations. **05**
- (c) A transistor used in CB circuit has the following set of parameters $h_{ib} = 35 \text{ Ohm}$, $h_{fb} = -0.98$, $h_{rb} = 5 \times 10^{-4}$, $h_{ob} = 10^{-6} \text{ s}$. With $R_s = 1 \text{ k}$ and $R_c = 10 \text{ k}$. Calculate (i) r_{in} (ii) r_{out} (iii) A_i and (iv) A_v . **04**
- Q.5** (a) Explain the cross section of P- channel enhancement MOSFET with the help of neat sketch. Draw and explain symbol of this device. **05**
- (b) Explain static characteristic of CS N-channel JFET with appropriate circuit diagram. **05**
- (c) For a transformer coupled class A amplifier which provides power of 4.5W to 4 ohm load and $V_{cc} = 30 \text{ V}$. Find (i) Transformer turn ratio (ii) Collector current and (iii) Transformer power rating. **04**
- OR**
- Q.5** (a) Explain the cross section of N-channel enhancement MOSFET with the help of neat sketch. Draw and explain symbol of this device. **05**
- (b) Compare MOSFET and JFET. **05**
- (c) Calculate the efficiency of a class B amplifier for a supply voltage $V_{cc} = 24 \text{ V}$ with peak output voltage of 22V. **04**
