

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-III Regular / Remedial Examination December 2010****Subject code: 131101****Subject Name: Basic Electronics****Date: 13 /12 /2010****Time: 10.30 am – 01.00 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 (a)** Answer the following: **07**
- (i) What is semiconductor? Define a hole in semiconductor
 - (ii) State the Pauli exclusion principle
 - (iii) Sketch the piecewise linear characteristics of p-n diode
 - (iv) Define an electron volt (eV)
 - (v) State the mass-action law as an equation and in word.
 - (vi) What is cutin voltage? Write approx. value of cutin voltage for silicon and germanium diode
 - (vii) Write the equation for the volt-ampere characteristic a photo diode
- (b)** Draw and explain bridge rectifier circuit with capacitorfilter. Draw necessary waveforms. **07**
- Q.2 (a)** Draw the circuit of CE configuration of transistor. Explain Input and output characteristics. Derive $\alpha = \beta / \beta + 1$ **07**
- (b)** (i) Draw symbol and explain briefly the working principle Breakdown diode and Tunnel diode **04**
- (ii) Write principle and applications of light emitting diode **03**
- OR**
- (b)** (i) Describe the Hall effect. Which properties of a Semiconductor are determined from Hall effect experiment? **04**
- (ii) Explain electrical properties of germanium and silicon (conductivity ,the mobility and the energy gape) **03**
- Q.3 (a)** Draw following diode circuits with input and output Waveforms:
- (i) Voltage doublers circuit **03**
 - (ii) Positive clipping circuit **02**
 - (iii) Negative clamper circuit **02**
- (b)** (i) A $5k\Omega$ load is fed from a bridge rectifier connected with a transformer secondary whose primary is connected to 460V, 50 Hz supply. The ratio of number of primary to secondary turns is 2 : 1. Calculate dc load current ,dc load voltage , ripple voltage and PIV rating of diode, **04**
- (ii) A $100\mu F$ capacitor when used as a filter has 12 V dc Across it with a terminal load resistor of $2.5k\Omega$. If the rectifier is full wave and supply frequency is 50 Hz calculate the percentage of ripple in the output **03**
- OR**
- Q.3 (a)** Explain the h-parameter model of CE amplifier with Bypass resistor R_E and derive the expression for A_i , A_v , R_i , R_o **07**
- (b)** Find h_{re} in terms of the CB h-parameters **07**

- Q.4 (a)** What is biasing? Why biasing is required for transistor? List biasing methods for transistor. Draw and explain the circuit of voltage divider biasing **07**
- (b)** Where CC configuration is used? Draw circuit of CC and CB configuration of transistor. Compare current gain, voltage gain, input impedance and output impedance of both **07**

OR

- Q.4 (a)** A CE amplifier using npn transistor has load resistance R_L connected between collector and V_{cc} supply of + 16 V. For biasing resistor, R_1 is connected between V_{cc} and base. Resistor $R_2 = 30 \text{ k}\Omega$ is connected between base and ground. $R_E = 1 \text{ k}\Omega$. Draw the circuit diagram and calculate the value of R_1 , R_C , stability factor S if $V_{BE} = 0.2 \text{ V}$, $I_{EQ} = 2 \text{ mA}$, $V_{CEQ} = 6 \text{ V}$, $\alpha = 0.985$ **07**
- (b)** Design a fixed bias circuit using silicon npn transistor which has $\beta_{dc} = 150$. The dc biasing point is $V_{CE} = 5 \text{ V}$ and $I_c = 5 \text{ mA}$. Supply voltage is 10V. Write advantages and disadvantages of fixed bias circuit. **07**

- Q.5 (a)** (i) Define the pinch-off voltage V_p . Sketch the depletion region before and after pinch-off. **03**
- (ii) Sketch the cross section of a P-channel enhancement MOSFET. Show two circuit symbols for MOSFET **04**
- (b)** Draw circuit of an idealized class-B push-pull power amplifier and explain its operation with the help of necessary waveforms. **07**

OR

- Q.5 (a)** (i) Compare different types of power amplifier based on conduction angle, position of Q-point, efficiency and distortion **04**
- (ii) Draw circuit of transistor as a switch **03**
- (b)** A MOSFET has a drain-circuit resistance R_d of $100 \text{ k}\Omega$ and operates at 20 kHz . The MOSFET parameters are $g_m = 1.6 \text{ mA/V}$, $r_d = 44 \text{ k}\Omega$, $C_{gs} = 3 \text{ pF}$, $C_{ds} = 1 \text{ pF}$, $C_{gd} = 2.8 \text{ pF}$. Calculate the voltage gain of this device. **07**
