

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

# 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 5kΩ 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 100μF capacitor when used as a filter has 12 V dc Across it with a terminal load resistor of 2.5kΩ. 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 symbol 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 100K and operates at 20 kHz. The MOSFET parameters are  $g_m = 1.6 \text{ mA/V}$  ,  $r_d = 44 \text{ K}$  ,  $C_{gs} = 3 \text{ Pf}$   $C_{ds} = 1 \text{ pF}$  ,  $C_{gd} = 2.8 \text{ pF}$ . Calculate the voltage gain of this device . **07**

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