Enrolment No.

# **GUJARAT TECHNOLOGICAL UNIVERSITY** BE - SEMESTER-III • EXAMINATION – SUMMER • 2014

Subject Code: 131101

**Subject Name: Basic Electronics** 

## Time: 02.30 pm - 05.00 pm

### Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Explain Hall effect phenomenon and list out its applications. Quantitatively 07 discuss the use of Hall effect to determine mobility.
  - (b) Derive continuity equation for carrier concentration in body of a semiconductor. 07
- Q.2 (a) Discuss the process of splitting of energy levels of isolated atoms into energy 07 bands as these atoms are brought into close proximity to form a crystal.
  - (b) Draw diode I-V characteristic, discuss its temperature dependence and obtain 07 expression for diode dynamic resistance.

#### OR

- (b) Explain working of Tunnel diode. Draw its I-V characteristic and symbol. List 07 out applications of Tunnel diode.
- **Q.3** (a) For a sinusoidal input of 10 V peak, sketch  $I_R$  and  $V_O$  in the circuit shown in **07** Fig. Q. 3 (a). Assume ideal diode with cut-in voltage equal to 0.7 V.
  - (b) Draw BJT circuit in common-base configuration as well as its input and output 07 characteristics. Explain base-width modulation for the same.

#### OR

- **Q.3** (a) A symmetrical 5 KHz square way that varies between + 10 V and -10 V is impressed upon the clipping circuit shown in Fig. Q: 3(a) OR. Assume for diode:  $R_f$  (forward bias resistance) = 0,  $R_r$  (reverse bias resistance) = 2 M $\Omega$ , Cut-in voltage = 0. Sketch the steady state output waveform, indicating value of maximum, minimum, and constant portion.
  - (b) In diode connected transistor circuit shown in Fig. Q: 3 (b) OR, the transistor **07** has  $\beta = 19$ . If  $V_E = 4$  V, determine the value of R<sub>B</sub>. Neglect base-to-emitter junction voltage in the calculations.
- Q.4 (a) Derive expression for  $A_I$ ,  $A_V$ ,  $Z_i$ , and  $Y_O$  for a basic amplifier circuit in terms of **07** h-parameters.
  - (b) What do you understand bias compensation? Draw and explain diode 07 compensation circuit for  $V_{BE}$ .

#### OR

- Q.4 (a) Derive expression for  $A_I$ ,  $A_V$ ,  $Z_i$ , and  $Y_O$  for a common-collector amplifier 07 circuit using simplified hybrid model.
  - (b) Explain thermal runaway. Show graphically that thermal runaway cannot take 07 place if the quiescent point is located at  $V_{CE} < (1/2) V_{CC}$ .
- Q.5 (a) Draw two-dimensional structure of n-channel MOSFET. Explain its working. 07
  - (b) Explain push-pull arrangement of transistors and discuss its advantages. 07

### OR

- **Q.5** (a) Explain the use of FET as a voltage variable resistor.
  - (b) Draw transformer-coupled audio amplifier circuit. Show that the maximum 07 value of conversion efficiency for this circuit is 50 %.

07

# Date: 30-05-2014

## **Total Marks: 70**



Q: 3 (b) OR