Total No. of printed pages = 4

3 (Sem 1) ELE M2

2015

ELECTRONICS

(Major)

Paper : 1.2

(Solid State Devices)

Full Marks – 60

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer all questions : $1 \times 7 = 7$

   (a) What are the different types of extrinsic semiconductors ?

   (b) Which group of elements are considered to be suitable for use as semiconductors ?

   (c) What is the barrier potential in terms of voltage in case of silicon diode ?

   (d) How is base current related to emitter current in case of a BJT ?

[Turn over

(e) Which mode of operation of the BJT is suitable for use as power amplifier ?

(f) In case of a diode, at constant temperature of forward voltage increases what will happen to the reverse saturation current ?

(g) If negative feedback is used, what will happen to distortion ?

2. Answer the following questions : 2×4=8

(a) What are the two different types of breakdowns observed in case of diode ?

(b) Write the diode current equation and identify the different components / variables / constants etc. used in the expression.

(c) What is PIV ?

(d) What is slew rate in case of an Op-AMP ?

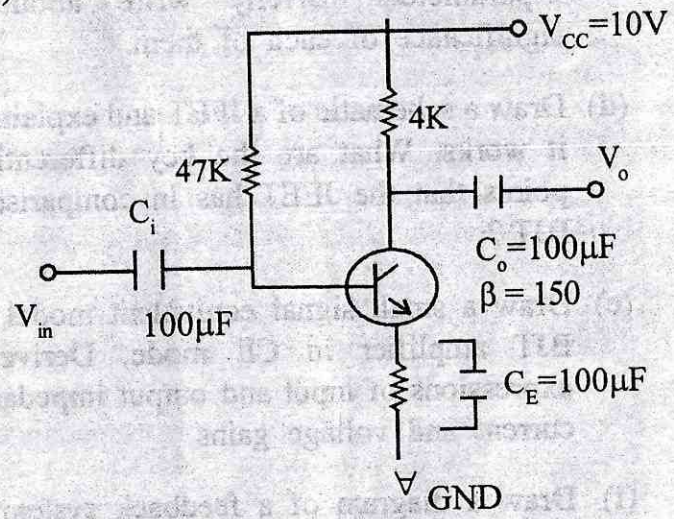
3. Answer any *three* questions : 5×3=15

(a) Draw the V.I characteristics of the diode and identify the different sections. Write briefly about each of the sections and their significance.

(b) Draw an arrangement showing the use of a Zener diode as a voltage regulator. Explain how voltage regulation is achieved.

(c) Mention the differences between load and line regulation. Draw relevant figures and use necessary formulae.

(d) A BJT based circuit is as below :



Find the voltage gain of the circuit.

(e) Draw the circuit of an active low pass second order filter. Explain its working. What are the benefits of using active filters.

4. Answer any *three* questions : 10×3=30

(a) Derive an expression for the junction capacitances of a diode showing dependence of carrier concentration and barrier width.

(b) What is a clipper ? What are the different types ? Draw the circuits and outputs of each of them.

(c) For a CE model BJT, determine the different h-parameters. Briefly write about the significance of each of them.

(d) Draw a schematic of a JFET and explain how it works. What are the key differentiating points that the JEET has in comparison to BJT ?

(e) Draw a small signal equivalent model of a BJT amplifier in CE mode. Derive the expressions of input and output impedances, current and voltage gains.

(f) Draw a diagram of a feedback system and derive an expression for gain of the system. Using the expression, explain the advantages obtained due to the use of negative feedback.

(g) Write short notes on (any *two*) : $2 \times 5 = 10$

(i) Schmitt trigger

(ii) Precision rectifier

(iii) Oscillator.