

2016

ELECTRONICS

(Major)

Paper : 1.2

(Solid State Devices)

Full Marks : 60

Time : 3 hours

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

1. Answer the following questions : 1×7=7

- (a) What is an intrinsic material?
- (b) What is doping?
- (c) Name a semiconductor material.
- (d) What is knee voltage of a semiconductor diode?
- (e) What is slew rate of an OP-AMP?
- (f) What is the full meaning of BJT?
- (g) What is biasing in case of a semiconductor device?

2. Answer the following questions : $2 \times 4 = 8$

- (a) Which group of materials is used with a pure semiconductor to obtain P-type and N-type semiconductors?
- (b) Derive an expression to link emitter current and base current of a BJT.
- (c) Mention a few applications of the diode.
- (d) Mention a few advantages obtained using negative feedback.

3. Answer any *three* of the following questions : $5 \times 3 = 15$

- (a) Draw a circuit to show how the diode works as a full-wave rectifier. Explain the working.
- (b) Draw a fixed bias circuit of a BJT. Determine the values of input resistance, output resistance, current gain and voltage gain.
- (c) What are the primary differences between a BJT and a JFET? What are the respective advantages and disadvantages of BJT and JFET?
- (d) Mention a few characteristics of ideal OP-AMP.

4. Answer any *three* of the following questions : $10 \times 3 = 30$

- (a) Derive an expression for diode forward current showing the dependencies of different carrier concentrations.
- (b) For a diode circuit, draw a load line and fix a Q-point. Show how limits of operations can be determined. Draw a circuit of a voltage doubler. Explain its working.
- (c) For a BJT in CE mode, draw the output characteristics. Draw a circuit to derive the output characteristics. Explain the working of the circuit and identify different parts of the output characteristics.
- (d) What are different classes of power amplifier? Name them. Draw circuits and output waveforms. Also mention the advantages and disadvantages.
- (e) Prove that, due to the use of negative feedback, distortion of a circuit reduces.
- (f) What are active filters? What are the advantages? Draw the circuit of a first-order active filter and explain its working.
