2017

ELECTRONICS

(General)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Fill in the blanks : 1×7=7

(a) A device which converts a.c. voltage into d.c. voltage is called a _____.

(b) The _____ of rectification is defined as the ratio of the d.c. output power to the input a.c. power.

(c) The process of adding impurities to a pure semiconductor is called _____.

(d) The voltage where the current starts to increase rapidly is called the _____ voltage of the diode.

(e) The resistance offered by a doped semiconductor is called the _____ resistance.

(f) The reverse saturation current is dependent on _____.

(g) Reverse breakdown voltage for a diode is typically greater than _____V.

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

(a) What is *Q*-point?

(b) What is diffusion capacitance?

(c) What is peak-inverse voltage?

(d) What is breakdown voltage?

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

(a) Explain the working principle of bridge rectifier with diagram.

(b) Explain how current flows in a *p-n-p* transistor.

(c) Draw the characteristic curve of an SCR and explain.

(d) What are the advantages of negative feedback?

(e) What are the characteristics of an ideal OP-AMP?

(Continued)

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

(a) Explain the formation of depletion layer in a *p-n* junction diode. Draw the *V-I* characteristic curve of a *p-n* junction diode and explain different parts of it. 5+5=10

(b) Describe the working of an *n-p-n* transistor. What is leakage current? A transistor has an emitter current of 8 mA and α of 0·99. What is the value of the collector current? 5+3+2=10

(c) Distinguish between FETs and BJTs. What is the difference between JFET and MOSFET? Give the construction of an *n*-channel MOSFET with diagram. 3+3+4=10

(d) Draw the block diagram of a feedback amplifier and derive an expression for the voltage gain with feedback. What type of feedback is used in oscillation and why? An amplifier has a voltage gain of −100. The feedback ratio is −0·04. Find the voltage gain with feedback. 5+3+2=10

(Turn Over)

(e) Show how OP-AMP can be used as non-inverting amplifier. Also deduce the relation between input and output voltages. For the circuit of inverting amplifier, $R_f = 100\ k\Omega$, $R_1 = 10\ k\Omega$ and $v_i = 1\ V$, calculate voltage gain and output voltage. What is CMRR?

5+3+2=10

(f) Write short notes on any *two* of the following : 5×2=10

(i) Varactor diode

(ii) Tunnel diode

(iii) Zener diode

(iv) Schottky diode

★ ★ ★