WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 2nd Semester Examination, 2020

ELSACOR03T-ELECTRONICS (CC3)

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

SECTION-A

Answer any *five* questions from the following   2×5 = 10

1. What is the mass-action law for carrier concentrations in a semiconductor?

2. What is the function of a clipper circuit?

3. Define base spreading resistance in connection with bipolar junction transistor.

4. Differentiate between ohmic and rectifying contacts.

5. Why Ge is not used in SCRs?

6. Define the firing angle of an SCR.

7. Define a crystal lattice. What is primitive cell?

8. What do you mean by mobility of charge carriers?

SECTION-B

Answer any *two* questions from the following   15×2 = 30

9. (a) What is the position of the Fermi level in an intrinsic semiconductor? How does its position change when (i) donors and (ii) acceptors are added to the semiconductor?   2+1+1

   (b) 'The energy levels of an atom produce energy band in a solid' — Explain.   4

(c) Differentiate between zener breakdown and avalanche breakdown. 4

(d) Briefly discuss on the working principle of varactor diode. 3

10.(a) Derive the relationship $I_C = \beta I_B + (1+\beta)I_{CO}$, where the symbols have their usual meanings. 3

(b) Define base transport factor and base-width modulation in connection with bipolar junction transistor. 4

(c) Write short notes on any *two* of the followings: 4+4

   (i) Construction, working and characteristics of SCR.

   (ii) Construction, working and characteristics of junction field effect transistor.

   (iii) Basic constructional features and applications of complementary MOS (CMOS).

11.(a) Write a short note on drift and diffusion current. $2\frac{1}{2}+2\frac{1}{2}$

(b) "A BJT is a current operating device while an FET is a voltage operating device" — Justify the statement with necessary explanation and characteristic diagram. 5

(c) Explain the principle of operation of a solar cell with the help of a suitable diagram. 5

12.(a) What is meant by Pinch-off in a JFET? Explain why complete Pinch-off cannot occur. 3+2

(b) What is effective mass? If the effective mass of holes in a material is 4 times that of electrons, find the temperature at which the Fermi level will be shifted by 10% from the middle of the forbidden energy gap. [Given $E_g = 1\,eV$]. 2+3

(c) Write a short note on Hall effect. 5

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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