Roll No. ....

OLE-3003

B. Tech. 1st Semester (CSE)
Examination – April, 2021

SEMICONDUCTOR PHYSICS

Paper : BSC-PHY-103-G

Time : Three Hours]   *[Maximum Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. **1** is *compulsory*. All questions carry equal marks.

1. (a) Explain the term effective mass.

   (b) Discuss the formation of depletion layer in semi-conductor diode.

   (c) What do you mean by drift velocity ?

   (d) Semiconductors have negative temperature coefficient of resistance. Explain its meaning.

   (e) Write a short not on photovoltaic effect.

   (f) What do you mean by a phonon ? $6 \times 2.5 = 15$

UNIT – I

2. What is the effect of periodic potential on the energy of electron in a metal? Explain it on the basis of Kroning penny model. 15

3. (a) Discuss the motion of a free electron in one dimensional potential box and derive expressions for eigen wave function and eigen state. 10

   (b) What is Fermi energy and calculate its value for free electron gas at $0° K$? 5

UNIT – II

4. Derive an expression for the carrier concentration in intrinsic semiconductors. What would be the position of Fermi level ? Explain. 15

5. (a) Write a short note on Metal semiconductor junction (Ohmic and Schottky). 8

   (b) Explain drift and diffusion current in semiconductors. 7

UNIT – III

6. (a) Explain Fermi golden rule for transition rates. 10

   (b) On account of optical transition define term absorption, spontaneous emission and stimulated emission. 5

7. Drive an expression for joint density of state of photons. 15

UNIT – IV

8. Describe four probe method with neat diagram to determine resistivity of a semiconductor crystal. 15

9. (a) Explain the concept of quantum well, wire and dot and derive the density of states. 10

(b) Write short note on DLTS. 5

———————