Roll No. .....

3003

B. Tech 1st Semester (CSE) Examination – December, 2019

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*.

1. (a) State Bloch theorem and write Bloch function ?

(b) What do you mean by knee voltage in p-n junction ?

(c) Write a short note on Fermi energy.

(d) What do you mean by radiative and non-radiative emission ?

(e) Explain why a semiconductor acts as an insulator at $0°k$ and why its conductivity increases with increasing temperature.

(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 and explain the formation of energy bands. 15

3. (a) Obtain an expression for energy levels in one dimensional free electron gas. 10

(b) What is the main difference between metals, semiconductors and insulators ? 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. Write a short note on : $5 \times 3 = 15$

(a) Intrinsic and extrinsic semiconductor

(b) Drift and diffusion current

(c) Metal semiconductor junction (Ohmic and Schottky)

UNIT – III

6. (a) Drive the expression for density of states of photons. 10

(b) What is difference between Spontaneous and Stimulated emission ? 5

7. Drive an expression for the conductivity of metals on the basis of Drude model. 15

UNIT – IV

8. Explain the principle, working and application of UV-visible spectroscopy. 15

9. (a) Derive the expression for density of state in 2D, 1D and 0D. 9

(b) Explain the concept of quantum well, wire and dot. Citing necessary examples. 6
