B. Tech. 2nd Semester Re-(F. Scheme)

Examination, June–2010

PHYSICS–II

Paper–Phy.–101–F

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any* ***five*** *questions Q. No.* **1** ***is compulsory.*** *Select* ***one*** *question from each section. Each question carry equal marks. (20 marks each).*

1. (i) Sodium metal crystallises in body centred cubic lattice with the cell edge, 4.29 A°. What is the radius of sodium atom ? What is the length of body diagonal of the unit cell ? 2

(ii) Explain the existence of neutron and proton inside the nucleus ? 2

(iii) Write the features of "Nano Systems" ? 2

(iv) What is fermi level and fermi energy ? 2

(v) Is ohm's law obeyed in semi conductor or not ? 2

(vi) Work function of metal is 2eV, find out the maximum wavelength of photon required to emitt electron from its surface ? 2

(vii) Explain principle of Solar cell. 2

(viii) When the current is circular magnetic field is straight explain. 2

(ix) Why does a paramagnetic sample display greater magnetism, when cooled ? 2

(x) Define Curie. Law in magnetism. 2

Section–A

2. (a) What do you understand by Bravias lattices ? Explain different types of Bravias lattice in two and three dimensions. 6

(b) Explain X-Ray diffraction and drive an expression for Bargg's law. 6

(c) Explain the concept of Miller indices. Deduce formula for distance between two adjacent planes of Face centred lattice. 8

3. (a) Derive time dependent Schrodinger equation for a free particle in one dimension. Extend the result to three dimensions. 10

(b) What is quantum mechanical, one dimension box ? Write down Schrodinger equation for it and obtain eigen functions and eigen values. Prove that momentum of the particle in box is quantized. 10

Section–B

4. (a) What do you understand by quantum size affect and quantum dots ? Write down the applications of Nano System. 10

(b) Explain the classical free electron theory. What are the elements of classical free electron theory and explain its limitations ? 10

5. (a) Explain Drude's theory of conduction in detail. 6

(b) Explain the quantum theory of free electrons. 7

(c) Find out expression for Richardson's equations. 7

Section–C

6. (a) What do you understand by Hall effects ? Find out expression for Hall voltage and Hall resistance. What are the applications of Hall effects ? 12

(b) Explain the classification of solids into metal, semiconductor's and insulators using energy band diagram. 8

7. (a) What is the principle of photo cell ? Describe a photocell and what are its applications. 10

(b) What do you understand by photoconductivity in insulating crystal ? Explain the applications of photo conductivity in detail. 10

Section–D

8. (a) Explain the electron theory of magnetism for diamagnetic substances. 10

   (b) Discuss Langevin's theory of paramagnetism and hence derive Curies Law. 10

9. (a) Explain the domain theory of ferromagnetism. 10

   (b) What are the categories into which materials are classified ? How can you distinguish between material of each class ? 10