Registration No. :

Total number of printed pages – 2

Third Semester (Back / Special) Examination – 2013

PHYSICS – II

BRANCH : BIOTECH, MM, MME

QUESTION CODE : D 193

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2×10

    (a) The lattice constant of a cubic lattice is 'a'. Calculate the spacing between (111) planes.

    (b) The applied magnetic induction in a cyclotron is 12000 gauss. Calculate the frequency of the RF voltage source to accelerate protons.

    (c) What is the difference between cyclotron and synchrocyclotron ?

    (d) Distinguish between intrinsic and impurity semiconductors.

    (e) Distinguish between step index and graded index optical fibers.

    (f) Mention four application of lasers.

    (g) Mention the principle of LED. Write any two applications.

    (h) What are color centers ?

    (i) Mention any four commercial applications of superconductivity.

    (j) What are Quantum dots ?

2. (a) Give the construction of a Van de Graff accelerator and explain how it works.   4

    (b) Describe the construction and working of a betatron by a neat diagram. Derive an expression for betatron condition.   6

P.T.O.

3. (a) What is reciprocal lattice ? Distinguish between reciprocal and real space. Show that magnitude of reciprocal lattice vector is inversely proportional to the interplanar spacing of the lattice planes. 6

   (b) Define structure factor. Show that structure factor is independent of shape and size of unit cell and depends only on Miller indices of planes. 4

4. (a) What are carbon nanotubes ? Draw the structure of carbon nanotubes. Briefly discuss the electrical and thermal properties of CNT. 5

   (b) Derive Laue's condition in scalar and vector form. 5

5. (a) What is Meissner effect ? Show that superconductors exhibit perfect diamagnetism. 6

   (b) Distinguish between type – I and type –II superconductors with examples. 4

6. (a) Derive the London's equations and explain the term penetration depth. 6

   (b) The London penetration depths for Pb at 3k and 7.1k are respectively 39.6 nm and 173nm. Calculate its transition temp. as well as depth at 0k. 4

7. (a) With principle, describe the construction and working of a light emitting diode. 5

   (b) Write short notes on : 5

   (i) Frenkel defect

   (ii) Schottky defect

8. (a) What is advantage of graded index optical fiber over step index optical fiber ? 3

   (b) Draw the block diagram of Fiber optics communication link and explain the working of each section. 5

   (c) In a step index optical fiber and refractive indices of core and cladding are 1.52 and 1.50 respectively. Calculate the numerical aperature of the fiber. 2