Registration No. :

Total number of printed pages – 2

Third Semester Examination – 2013

PHYSICS – II

BRANCH : BIOTECH, MM, MME

QUESTION CODE : C-509

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) What is the principle of Tandem accelerator ?

    (b) Deduce the Miller indices of a plane which cuts off intercepts in the ratio 1a : 3b : (–2c) along the three axes, where a, b, c are primitives.

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

    (d) Distinguish between intrinsic and impurity semiconductors.

    (e) What are Quantum dots ?

    (f) Explain 1-2-3 superconductors.

    (g) What are color centres ?

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

    (i) Mention four application of lasers.

    (j) The critical temperature for mercury with isotopic mass 199.5 is 4.18 K. Calculate its critical temperature when its isotopic mass changes to 203.4.

2. (a) Describe with principle the construction and working of a Van de Graff accelerator.   5

    (b) In a drift tube portion of a linear accelerator, protons are accelerated from 0.75 MeV to 100 MeV, AC voltage applied has a frequency of 200 MHz. Find the length of the 1st and last drift tubes.   5

P.T.O.

3. (a) Give the construction and working of a betatron. Derive an expression for betatron condition. 5

   (b) What are carbon nanotubes ? Describe the electrical and thermal properties of carbon nano tubes ? 5

4. (a) Derive the Laue's condition in scalar and vector form. 4

   (b) Define atomic form factor. What does it represent ? Derive an expression for it. 4

   (c) Discuss any two thermodynamic properties of superconductors. 2

5. (a) What is Meissner effect ? Show that superconductors exhibit perfect diamagnetism. 4

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

   (c) What are the possible applications of super conductors ? 2

6. (a) Derive the London's equation and explain the term penetration depth. 5

   (b) Calculate the glancing angle of the (110) plane of a simple cubic crystal $(a = 2.814 \text{ Å})$ corresponding to second order diffraction maximum for the X – rays of wavelength 0.710 Å. 3

   (c) Distinguish between elemental and compound semiconductors. 2

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

   (b) Explain how a semiconductor junction diode can be used as a laser ? What are its merits over the other radiation–pumped lasers ? 5

8. (a) Write short notes on : 4

   (i) Frenkel defect

   (ii) Schottky defect

   (b) What are the advantages of fibre optics communication systems ? 2

   (c) Explain how a four level laser system works ? 4

———