Registration No. :

Total number of printed pages – 2

Third Semester Regular Examination – 2014

PHYSICS – II

BRANCH : BIOTECH

QUESTION CODE : H 378

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) Write the difference between d.c. accelerator and r.f. accelerator ?

    (b) What is the function of a cyclotron ?

    (c) The crystallographic axes in a cubic crystal are along X, Y, Z axes. What are the miller indices of the planes parallel to the YZ plane ?

    (d) Explain why Compton scattering is neglected in X-ray diffraction.

    (e) Why an increase in temperature decreases the resistivity of a semiconductor ?

    (f) What are Quantum dots ?

    (g) What are top up and top down processes for preparation of nanophase materials ?

    (h) On the basis of geometry of crystals what are different types of defects ?

    (i) What is step index optical fiber ? Draw its refractive index profile.

    (j) Distinguish between spontaneous emission and stimulated emission.

2. (a) Give the construction of a betatron. Mention the functions of the non-uniform and time varying magnetic field.   5

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(b) Describe the construction of a linear accelerator. Show that the velocities of the ion in the tubes are in the ratio $1 : \sqrt{2} : \sqrt{3} : \ldots\ldots$ 5

3. (a) What is meant by reciprocal lattice ? 5

(b) Explain how Kronig-Penney model predicts presence of energy bands in crystalline solids. What are the other conclusions drawn from it ? 5

4. (a) Describe the fabrication and structure of carbon nanotubes. What are its electrical properties ? 5

(b) Compare the nano synthesis properties between Inert gas condensation and high energy ball milling. 5

5. (a) Discuss different type of crystal imperfections with neat diagram. 5

(b) Mention the Laue conditions for crystal diffraction. Show that Bragg's condition follows from them. 5

6. (a) Derive London's equations for superconductor. How does it depend on temperature. 5

(b) Mention with proper diagram, the position of Fermi level in intrinsic and extrinsic (both donor and acceptor) semiconductors. GUNUPUR 5

7. (a) Explain the working principle of Ruby laser with a suitable diagram. 4

(b) Draw the block diagram of Fiber optics communication Link and explain about the different components. 4

(c) Calculate the numerical aperture and acceptance angle of a fiber with a core index of 1.54 and a cladding index of 1.50. 2

8. Write short notes on any two : 5×2

(a) Cooper pair

(b) Type-I and Type-II superconductors

(c) Schottky defect and Frenkel defect

(d) Population inversion.