Third Semester Examination – 2010

PHYSICS – II

(New and Old Course)

Full Marks – 70

Time : 3 Hours

(Students are required to give their answer any one Course according to the Syllabus)

(NEW COURSE)

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 function of a cyclotron ?

   (b) Why visible light is not preferred for Bragg's diffraction ?

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

   (d) Differentiate between synchrotron and synchrocyclotron.

   (e) What are indirect band gap semiconductors ?

   (f) How the entropy of superconductor varies with temperature ? Graphically show the same.

(g) What is cooper pair ?

(h) Under what condition does stimulated emission take place?

(i) Define lasing threshold.

(j) How attenuation in a fiber is measured ? Write its unit ?

2. (a) Write the use of radioisotopes in various fields.   6

(b) In a cyclotron, the deuterons describe a circle of radius 32 cm just before coming out of the 'dees'. If the frequency of the R.F. source is 10 MHZ, find the strength of the magnetic field and speed of deuterons emerging from the cyclotron.   4

3. (a) Give the principle and working of Betatron.   5

(b) What is Meissner effect ? Classify superconductors on the basis of Meissner effect.   5

4. (a) What are the conclusions drawn from Kronig-Penney model?   7

(b) How energy gap in a superconductor differs from that of a semiconductor?

3

5. (a) Find out London's equations for superconductor.   6

(b) How is optical feedback realized in laser system?   4

6. (a) Explain the terms setting time and Q-switching of a laser.   4

(b) Explain the working principle of Ruby laser with a suitable diagram.   6

7. (a) Draw the block diagram of Fiber Optics Communication Link and explain about the different components. 7

(b) Determine the acceptance angle for an optical fiber having core, cladding refractive indices 1.58 and 1.48 respectively. Assume that the fiber is surrounded by air. 3

8. (a) What are the advantages of laser diode over LED ? 4

(b) Find out the expression for ratio of spontaneous emission to stimulated emission and hence show that spontaneous emission predominates over stimulated emission. 6

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*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 followings questions :   2×10

    (a) What the acronym of LASER ?

    (b) What is the working principle of cyclotron ?

    (c) Draw the RI profile of step-index fibre.

    (d) Give two examples of compound superconducting materials.

    (e) Write the expression of Betatron condition.

    (f) Draw the energy band diagram of 3-level LASER.

    (g) What is Bragg's condition for crystal diffraction?

    (h) Which of the following has greater wavelength?

        (i)   X-ray

        (ii) γ-ray

    (i) Name the active material of Ruby in Ruby-LASER.

    (j) What is the working principle of LED ?

2. (a) Describe the construction and working of Gas LASER. 6

   (b) Explain Meissner's effect. 4

3. (a) Give four important characteristics of superconductors. 4

   (b) In a cubic crystal the lattice parameter in a = 5.4A°. Calculate the spacing between (111). 3

   (c) Write the expression for Fermi-Dirac distribution law. 3

4. (a) Graphically represent the variation of Intensity of magnetization with magnetizing field in soft & hard superconductors. 4

   (b) Draw the ray diagram of the principle of optical fibre communication. 3

   (c) Distinguish between spontaneous and stimulated emission of radiation. 3

5. (a) What is the significance of Miller indices ? 5

   (b) A crystal plane cuts the crystallographic axes at 2, 3 and 5 units respectively. Find its Miller indices. 5

6. (a) What is the need of particle accelerators ? 5

   (b) Describe construction and working principle of cyclotron. 5

7. (a) Derive Bragg's law 5

   (b) Draw the block diagram of FOCL and explain briefly the function of each block. 5

8. (a) Describe the construction and working principle of LED. 7

   (b) What is coherence length of LASER? 3

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