24003

B.Tech. 1st Semester F. Scheme

Examination, December–2014

PHYSICS

Paper–PHY-101 F

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

*Note : Students have to attempt **five** questions in total, selecting at least **one** question from each section. **Question No. 1 is compulsory.** Each question carries equal marks (20 marks).*

1. (a) Discuss how step index fiber differs from graded index fiber.

(b) What is optical pumping ?

(c) Write a short note on dispersive power of grating.

(d) State Gauss's law with dielectric.

(e) Write Lorentz transformation equations of space and time.

(f) Discuss some practical applications of superconductors.

(g) How we can generate circularly polarized light ?

(h) Write short note on Einstein's coefficients.

(i) An optical fiber has a numerical aperture 0.15 and cladding refractive index 1.55. Determine the acceptance angle of the fiber in water whose refractive index is 1.33.

(j) Calculate the specific rotation if the plane of polarization is turned through 22°, traversing 15 cm length of 20% sugar solution. 10×2=20

Section–A

2. (a) Explain the set up and working of Michelson-interferometer. 10

(b) Discuss the Fraunhoffer diffraction at a single slit and show that the relative intensities of maximas are in the ratios of 1:1/22:1/61:1/121. 10

3. (a) What are Newton's rings ? Explain the formation of Newton's ring in reflected light ? 10

(b) What is a grating ? Explain the spectra formed by a plane transmission diffraction grating. 10

Section–B

4. (a) Describe the construction and working of Nicol Prism. 10

(b) Discuss the construction and working of Laurent's half shade polarimeter. 10

5. (a) Discuss the terms : Stimulated absorption, Spontaneous emission, Stimulated emission. 10

(b) Describe the principle, construction and working of a He-Ne laser with the help of a neat diagram. 10

Section–C

6. (a) What is meant by Numerical aperture of an Optic Fiber ? Derive the expression for the NA of a step index fiber. 10

(b) Derive an expression for the energy density of electric field established in a dielectric medium. 10

7. (a) What is Clausius-Mossotti relation ? Derive the Expression. 12

(b) Calculate the refractive index of the core and cladding material of a fiber having NA = 0.22, Δ =0.012, where the symbols have their usual meanings. 8

Section–D

8. (a) Discuss in detail the Michelson-Morley experiment and explain its importance. 10

(b) State and prove the law of equivalence of mass and energy. 10

9. (a) Derive the London's equations and discuss how its solution explain the Meissner effect and flux penetration ? 12

(b) Discuss the terms

(i) Type I

(ii) Type II superconductors

(iii) Meissner effect

(iv) Persistent current. 8