

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  $22^\circ$ , traversing 15 cm length of 20% sugar solution.  $10 \times 2 = 20$

### Section-A

2. (a) Explain the set up and working of Michelson-interferometer. 10
- (b) Discuss the Fraunhofer 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  $NA = 0.22$ ,  $\Delta = 0.012$ , 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

( 4 )

**24003**

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