

B. Tech. 1st Semester Examination, December-2012

PHYSICS-I

Paper- PHY-101-F

Time allowed : 3 hours ]

[Maximum marks : 100

*Note : Attempt five questions in all, selecting one question from each unit. Q. No. 1 is compulsory and contains ten sub questions each sub question carries equal marks. (2 marks)*

1. (a) What do you understand by blooming ? 2
- (b) What is the highest order of spectrum which can be seen by using a light of wavelength  $\lambda = 6,000\text{\AA}$  and a grating having 5,000 lines per cm on it. 2
- (c) State law of Malus. 2
- (d) What is the difference between spontaneous emission and stimulated emission. 2
- (e) What do you understand by attenuation dispersion ? 2
- (f) Why has water much greater dielectric constant than mica ? 2

- (g) Find energy corresponding to rest mass of positron. [Mass of positron =  $9.1 \times 10^{-31} \text{ kg}$ ] 2
- (h) Why is compensating glass plate used in Michelson-Morley-Experiments ? 2
- (i) What do you understand by positive and negative Crystals ? 2
- (j) What is the difference between interference and diffraction ? 2

**Section-A**

2. (a) Explain the formation of fringes in wedge shaped film. 10
- (b) Describe Michelson interferometer and explain how the circular fringes are formed. 10
3. (a) Describe how Newtons rings can be used to determine
- (i) Wavelength of Sodium light
- (ii) Refractive Index of a liquid. 15
- (b) Explain the Fraunhofer diffraction through single slit experiment. 5

## Section-B

4. (a) Explain clearly the methods of production and detection of plane, circularly and elliptically polarized light. 15
- (b) Calculate the thickness of a quarter wave plate for light of wave length  $5890\text{\AA}$  given  $\mu_o = 1.55$  and  $\mu_e = 1.50$ . 5
5. (a) Explain optical pumping. Explain He-Ne laser in detail. How the He-Ne laser is different from semi conductor laser ? 15
- (b) What are the characteristics of Laser ? 5

## Section-C

6. (a) How light propagate in optical fibers ? Explain the applications of optical fibers. 12
- (b) Explain single and Multimode fibers with examples. What do you understand by numerical aperture and V- number ? 8
7. (a) Find out the expression of Gauss's law in dielectrics. 7
- (b) Define polarization vector, displacement vector electric susceptibility, dielectric constant.



Derive the following relations.

$$(a) \quad E = \frac{E_0}{K}$$

$$(b) \quad \vec{D} = \epsilon_0 \vec{E} + \vec{P}. \quad 13$$

### Section-D

8. (a) Derive the formula for variation of mass of a particle with its velocity. 12
- (b) Show that  $x^2 + y^2 + z^2 - c^2 t^2$  is invariant under Lorentz Transformation. 4
- (c) Two inertial frame A and B are moving with a relative speed of  $\frac{C\sqrt{7}}{4}$ . If a rod of length L be placed at an angle of  $45^\circ$  with respect to the direction of motion in the frame A, what length will it seen to have in the other frame B. 4
9. (a) Describe London equations. 8
- (b) What is Meissner effect and also explain flux penetration ? 7
- (c) What are elements of BCS theory ? 5