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B.Tech. 1st Semester Examination,

December-2013

PHYSICS-I

Paper-Phy-101-F

Time allowed : 3 hours ] [ Maximum marks : 100

*Note : Attempt five questions. Question No. 1 is compulsory and select one question from each section. All questions carry equal marks.*

1. (a) Differentiate between quarter and half wave plate. 2
- (b) On what factors width of central maxima depends? 2
- (c) Explain spatial and temporal coherence. 2
- (d) What do you mean by amplitude division method? 2
- (e) Can more than one Signal be transmitted through optical fibre? Explain. 2
- (f) What is Meissner effect? 2
- (g) What do you understand by inertial frame and non inertial frame? 2

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- (h) The mass of moving electrons is  $n$  times its rest mass. Find its kinetic energy. 2
- (i) Write the Clausius-Mossotti equation. 2
- (j) What is Rayleigh's limit of resolution? 2

**Section-A**

2. (a) What are Newton's rings? Describe and explain the formation of Newton's rings in reflected monochromatic light. Prove that diameter of bright rings are proportional to the square root of odd natural numbers. 15
- (b) In a Newton's rings experiment the diameter of the 15th ring was found to be  $0.59 \times 10^{-2}$  m and that of the 5th ring was  $0.336 \times 10^{-2}$  m. If the radius of the plano convex lens is 1m. Calculate the wavelength of light used. 5
3. (a) What is a grating? Explain the spectra formed by a plane transmission diffraction grating and also discuss that the intensity of principle maxima decreases with increase of order. 15

- (b) Derive expressions for dispersive power

**Section-B**

4. (a) Give the construction and working of Lorentz half shade polarimeter. What is its main drawback? 15
- (b) A polarimeter tube of 35cm containing a sugar solution rotates the plane of polarization through  $20^\circ$ . If the specific rotation of sugar is  $60^\circ$ . Calculate the strength of sugar solution. 5
5. (a) Discuss Einstein's Co-efficient. Derive relation between them. 10
- (b) Describe the principle, construction and working of He-Ne gas laser. 10

**Section-C**

6. Give the principle of optical fibres. How the terms angle of acceptance and numerical aperture are used in optical fibre? How optical fibres can be used in medical and communication field? 20
7. (a) Derive an expression for the energy density of electric field established in a dielectric medium.

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- (b) What are three (03) electric vectors in dielectrics? Name and find relationship between them. 10

**Section-D**

8. (a) Derive expression of variation of mass with velocity. 12
- (b) State and prove the law of equivalence of mass and energy. 8
9. (a) Derive the London Equations and discuss how its solution explains Meissner effect and flux penetration. 12
- (b) Mention some important properties changes that occur in materials when they change from normal to super conducting state. 8