Roll No. ....

24003

B. Tech. 1st Semester "F Scheme"
Examination – December, 2010

PHYSICS-I
Paper : Phy-101-F

Time : Three hours]   [Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

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

1. (a) What do you mean by modal dispersion ?

   (b) Discuss differences between Fraunhofer and Fresnel diffraction.

   (c) What is meant by specific rotation ?

   (d) What are inverse Lorentz transformation equations ?

   (e) If the kinetic energy of a body is twice its rest mass energy, find its velocity.

   (f) What do you mean by population inversion ?

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(g) Explain Fresnel's Biprism.

(h) For a dielectric the value of dielectric constant is 1.329, calculate its electric susceptibility (χ_e).

(i) Calculate the minimum thickness of a quarter wave plate of calcite for $\lambda = 5460A°$, the bifringence of the plate $(\mu_e - \mu_o)$ being 0.172.

(j) Why sound wave is easily diffracted but light will not diffract in daily life ? $2 \times 10 = 20$

UNIT – I

2. (a) Explain the formation of interference fringes in a Michelson interferometer. Discuss its important applications. 15

   (b) A thin plate is introduced in the path of one of the beams of light in Michelson interferometer and it is found that 50 bands have crossed the line of observation. If wavelength of light is 5896 A° and $\mu = 1.4$, determine the thickness of the plate. 5

3. (a) Explain the phenomenon of diffraction through a single slit. 15

   (b) Calculate the angular width of the central maxima in the Fraunhofer diffraction pattern of a slit of width 12×10^{-7} m, when the slit is illuminated by a monochromatic light of wave length $6000A°$. 5

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UNIT – II

4. (a) Describe a Nicol's prisms, showing clearly how it is constructed and what is its action. 15

   (b) How we can produce plane polarized light from circular polarized or elliptically polarized light ? Explain. 5

5. (a) Describe the principle, construction and working of $He - Ne$ laser. 12

   (b) Explain the characteristics of laser light. 8

UNIT – III

6. (a) What is numerical aperture and acceptance angle ? Discuss in detail the various modes in fiber optic. 15

   (b) A light ray enters from air to fiber. Find the critical angle, acceptance angle and numerical aperture. Given, refractive index of air, core and cladding are 1, 1.5 and 1.45 respectively. 5

7. (a) State and prove Gauss law in dielectrics. 10

   (b) Show that $\vec{D} = \epsilon_0 \vec{E} + \vec{P}$ where the symbols have their usual meaning. 10

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UNIT – IV

8. Write short notes on :

   (a) Mass-Energy equivalence   10

   (b) Michelson-Morley experiment   10

9. (a) Derive London's equations for superconductivity.

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   (b) Explain type-I and type-II superconductors using Meissner Effect.   10

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