B.Tech.
FIRST SEMESTER EXAMINATION 2015-16
EAS101
ENGINEERING PHYSICS

Time: 2 Hours   Max. Marks: 50

Note: Attempts all Questions. All Questions carry equal marks.

1. Attempt all parts of the following.   [2x5 = 10]

    a. Differentiate inertial and non-inertial frame of references.
    b. Draw neat and clean diagram for Newton's rings experiment set-up.
    c. Discuss modal dispersion in optical fibers.
    d. Define Specific rotation.
    e. Draw labeled energy level diagram of Ruby laser.

2. Attempt **any three** of the following.   [5x3 = 15]

    a. A plane polarized light is incident on a quartz plate that is cut parallel to the axis. The minimum thickness of the plate for which E-ray and O-ray recombine to form a plane polarized light is 2.65×10^{-3} cm. if $\mu_e = 1.5500$, calculate μ_o [Given $\lambda = 5.2 \times 10^{-5}$ cm]
    b. A monochromatic light of wavelength 5860 Å is incident normally on a 2 cm wide grating. The first order spectrum is produced at an angle of 20° with respect to normal. Determine the total number of lines on grating.
    c. A light pulse is emitted from the origin of reference frame S_2 at $t = 0$. The distance covered by the light pulse in time t_2 is given by $x_2^2 = c^2 t_2^2$. Use Lorentz transformations to express this equation in terms of x_1 and t_1 and show $x_1^2 = c^2 t_1^2$.
    d. A step index fiber has a core refractive index 1.5 and a cladding of refractive index 1.47. The diameter of core of fiber is 100μm and the medium surrounding the fiber is air. Determine numerical aperture and acceptance angle.

3. Attempt **any one** of the following.   [5]

    a. Discuss the time dilation in detail. A process takes 1μs to complete in an atom at rest in a laboratory. Calculate the time required for this process to complete with respect to an observer in laboratory, if the atom is moving at a speed of 4×10^9 cm/s.

    b. Deduce Lorentz transformations for space and time.

4. Attempt **any one** of the following.   [5]
    a. Discuss interference in thin films with suitable diagram. Show that the patterns formed in reflected and transmitted systems of light are complementary to each other.
    b. Discuss Fraunhofer diffraction at double slits in detail. Draw the pattern for system of diffraction which has slit separation equal to slit width.

5. Attempt **any one of** the following.   [5]

    a. Show that elliptically and circularly polarized lights are special cases of plane polarized lights.
    b. Explain double refraction. Describe the construction, functioning and applications of Nicol prism.

6. Attempt **any one of** the following.   [5]

    a. Why LASER function is not possible in two energy levels? What are Einstein's coefficients? Deduce relation among these coefficients.
    b. What are optical active substances? Discuss half shade polarimeter and its working in detail.

7. Attempt **any one of** the following.   [5]

    a. Discuss the process of construction of hologram and reconstruction of image by hologram in detail. Also, write applications of holography.
    b. Classify optical fibers on the basis of mode and index profile. Also, discuss the propagation of light through optical fiber. Write formula for numerical aperture and acceptance angle.