No. of Printed Pages – **3** **PY-101**

Roll No. | | | | | | | | | | |

B. TECH.

FIRST SEMESTER EXAMINATION, 2015-16

PHYSICS

Time : **3 Hours** Max. Marks : **60**

Note : **(i)** Attempt **ALL** questions.
(ii) Choices are given in each question set.

1. Attempt any **Four** of the following questions: **3 x 4 = 12**

(a) Three equal positive charges are kept at the corners of an equilateral triangle. Calculate their mutual potential energy.

(b) Obtain boundary conditions for electric field and electric displacement vectors for dielectric - dielectric boundary.

(c) Explain the Poisson's equation for electric potential due to a uniform charge distribution. Under what conditions this becomes the Laplace's equation. How is it useful to obtain potential due to symmetric charge distribution?

(d) Derive the expression for obtaining electric potential and field at any point between two plates of an ideal parallel plate capacitor. The potential on the plates may be taken as V_1 & V_2 and their separation being d.

(e) State and prove uniqueness theorem.

(f) Using method of electrical images, find out the electric field due to charge +q placed at a distance 'a' near an infinite conducting sheet.

2. Attempt any **Four** of the following questions: **3 x 4 = 12**

(a) A laser light of 600nm wavelength is incident normally on a plane transmission grating having 1000lines/cm. How many orders of diffraction will be visible?

(b) How are two coherent sources obtained in a biprism? Why do the fringes disappear if the slit width is made large in a biprism experiment?

(c) Describe the formation of Newton's rings in reflected monochromatic light. Derive the formula for the diameter of the rings in different orders.

(d) Explain the Rayleigh criterion of resolution. Obtain an expression for the resolving power of a diffraction grating.

(e) A thin mica sheet (μ=1.6) is introduced in the path of one interfering beam, as a result the central fringe is shifted to 7^{th} bright fringe. Calculate the thickness of the sheet. (Wavelength of light used=5893Å).

(f) Obtain an expression for resultant intensity in Fraunhofer diffraction at a single slit.

3. Attempt any **Two** of the following questions: **6 x 2 = 12**

(a) What is dispersion in optical fiber? Mention different types of dispersions.

(b) In He-Ne laser, what is the function of the He atoms? With the help of an energy level diagram explain the working of He-Ne laser.

(c) What is specific rotation? Describe the construction and working principle of Laurent's half shade polarimeter.

4. Attempt any **Two** of the following questions: **6 x 2 = 12**

(a) What is meant by viscosity of a liquid? Derive an expression for coefficient of viscosity for a streamline flow of a liquid in a capillary tube.

(b) What is meant by time dilation? Establish a relation between proper and relativistic time.

(c) Show that space-time interval is invariant under Lorentz transformation.

5. Attempt any **Two** of the following questions: **6 x 2 = 12**

(a) Using Heisenberg's uncertainty principle, show that electron cannot exist in the nucleus.

(b) Write the Schrodinger equation for a particle in one dimensional box and solve it.

(c) What is Compton effect? Show that in Compton effect the change in wavelength is given by:

$$\lambda' - \lambda = \frac{h}{m_0 c}(1 - \cos\theta)$$

where symbols have their usual meaning.