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

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

B. TECH.

FIRST SEMESTER EXAMINATION, 2016-17

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) State and prove uniqueness theorem of electric potential in electrostatics.

(b) State and prove Poisson's equation in electrostatics.

(c) Explain the method of electrical images for solution of electrostatics problems. Using it find electric potential due to point charge near an infinite conducting plane.

(d) Calculate energy stored in a system of discrete charges.

(e) What are boundary conditions for electric field and displacement vector for a dielectric-dielectric interface?

(f) Show which of the following functions satisfy Laplace's equation.

(i) $V = \frac{1}{\sqrt{x^2+y^2+z^2}}$. **(ii)** $V = r\cos\theta$

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

(a) Discuss Fresnel's biprism method for finding wave length of light.

(b) Discuss formation of Newton's rings. Explain how these can be used to find refractive index of a liquid?

(c) What is Rayleigh's criterion of resolution? Derive an expression for resolving power of grating.

(d) Derive an expression for displacement of fringes in Fresnel's biprism experiment.

(e) A soap film of refraction index 1.33 is illuminated with light of different wavelengths at an angle of 45º. There is complete destructive interference for λ=5890Å. Find the thickness of the film.

(f) A diffraction grating has 6000 lines per cm. Calculate the angle between the first and second order lines for a light of wavelength 6000Å.

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

(a) Describe construction and working of Nicol's prism.

(b) **(i)** What is polarization of light? How we can differentiate polarized light from the ordinary light?

(ii) Derive an expression for numerical aperture of an optical fiber, in terms of refractive indices n_1 and n_2 of core and cladding, respectively.

(c) With the help of energy level diagram explain working of Nd-YAG laser.

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

(a) Define the term Viscosity. Derive Poiseuille's equation.

(b) Derive mass-energy equivalence relation.

(c) Explain Michelson-Morley's experiment and its implications.

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

(a) **(i)** What is Heisenberg's uncertainty principle? Discuss one example to illustrate it.

(ii) Discuss the basic postulates of quantum mechanics.

(b) **(i)** What is a wave function? What is its physical significance?

(ii) A photon of energy 1.02MeV is scattered through 90º by a free electron. Calculate the energy of photon and electron after interaction.

(c) Derive time independent Schrodinger's wave equations for non-relativistic free particle in potential V.