Roll No. ..... Total Pages : 04

BT-1/D-21 41014

APPLIED PHYSICS–I

AS-101-N

Time : Three Hours] [Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Obtain the conditions for the interference of light reflected by a thin parallel film. **6**

(b) What do you understand by Fresnal's biprism ? Derive an expression to determine the wavelength of light using Fresnel's biprism. **6**

(c) Explain why the centre of Newton's rings is dark. How can it be made bright ? **3**

2. (a) What are the differences between Fraunhofer and Fresnel diffraction ? **5**

(b) Explain method of wavelength determination by grating. What is dispersive power of a grating ? **8**

(c) The wavelength of sodium D-lines is 589.5 Å and 588.9 Å. What is the minimum number of lines a grating must have in order to resolve these lines in the first order spectrum ? **2**

Unit II

3. (a) Explain what is population inversion and pumping in lasers. **5**

(b) With neat diagrams, describe the principle, construction and working of He-Ne laser. Discuss the applications of lasers. **10**

4. (a) Describe the construction of a nicol prism and show how it can be used as a polarizer or an analyser. Distinguish between quarter-wave plate and half-wave plate. **10**

(b) What is double refraction ? **3**

(c) Determine the SI units of energy density $u(\omega)$, Einstein's coefficients A and B. **2**

Unit III

5. (a) What is Piezoelectric effect ? Explain how Ultrasonics can be generated by piezoelectric phenomena. **7**

(b) What is Magnetostriction ? **3**

(c) Describe a method used for measuring velocity of ultrasonic waves. **5**

6. (a) Describe the construction of an optical fibre with the help of a suitable diagram. Further describe different factors responsible for loss of signal propagating through a fibre. **8**

(b) Calculate the numerical aperture and acceptance of an optical fibre with $n_1 = 1.50$ and $n_2 = 1.45$. **3**

(c) Differentiate between step index and graded index fibre. **4**

Unit IV

7. (a) Prove that under condition ($v << c$), relativistic kinetic energy, changes to classical kinetic energy. **3**

(b) State postulates of special theory of relativity and using them derive Lorentz transformation equation. **6**

(c) Derive Energy mass relation. Compute the mass and velocity of an electron having kinetic energy 1.5 MeV. **6**

8. (a) Describe construction, working and application of Scintillation Counter. Explain why scintillation detectors are more sensitive that gas-filled detectors. **8**

(b) Describe the three modes by which gamma radiations interact with matter. **4**

(c) With the help of GM counter is it possible to give information about energy of the incident charge particle ? Justify your answer. **3**