

1E2204

B. Tech. II Sem. (Main) Exam., May – 2018  
PY-101 Engineering Physics

Time: 3 Hours

Maximum Marks: 80  
Min. Passing Marks: 28

*Instructions to Candidates:*

Attempt any **five** questions including Question No. 1, which is Compulsory.

All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. NIL2. NIL

Q.1 Compulsory

[8×2=16]

Answers for each sub-question be given in about 25 words -

- What is the shape and name of fringes in wedge shaped thin film?
- What is the condition to get missing spectra in plane transmission grating? Write its expression.
- State Law of Malus.
- What is Hall Effect? Write expression for Hall coefficient.
- Explain the presence of unmodified radiation in Compton scattering.
- Give the reason for high intensity of a laser.
- What are the differences between holography and photography?
- What is the physical meaning of numerical aperture of an optical fiber?

Q.2 (a) Draw labeled diagram of a Michelson's Interferometer. How shall we use it to measure wavelength of a monochromatic source of light? Explain the role of compensating glass plate in Michelson's Interferometer. [6]

(b) What is the working principle of anti-reflection coating? Derive an expression for refractive index of coating material & its thickness. Describe various applications of anti-reflection coating. [6]

(c) In Michelson's Interferometer the reading of a pair of maximum distinctness were found to be 0.6989 mm and 0.9334 mm. If mean wavelength of the doublet used is  $5893 \text{ \AA}$ , find the difference between wavelengths of components. [4]

Q.3 (a) Explain Rayleigh's criterion of resolution. What is meant by resolving power of a grating? Derive an expression for resolving power of grating & on what factor does it depend? [8]

(b) How will you distinguish between, [4]

(i) PPPL & EPL and

(ii) EPL & CPL

(c) 80 gm of impure sugar when dissolved in a litre of water gives an optical rotation of  $9.8^\circ$ , when placed in a tube of length 200mm. If specific rotation of sugar is  $66^\circ / \text{dm (gm/cc)}$ , find the percentage purity of sugar sample. [4]

Q/4 (a) Describe nature and origin of various forces existing between atoms of solid crystals. Explain the formation of covalent, ionic and metallic bonding in solids [6]

(b) What is X-ray diffraction? Deduce Bragg's Law for the diffraction of X-ray in a crystal, how Bragg's spectrometer is used to determine the wavelength of monochromatic X-rays? [6]

(c) Assuming that there are  $5 \times 10^{28}$  atoms/ $\text{m}^3$  in copper, find the Hall coefficient. [4]

- Q.5 (a) Obtain an expression for shift in wavelength of scattered photon by Compton scattering and show that Compton shift depends only on scattering angle. [8]
- (b) Write down the Schrödinger's time independent wave equation for a free particle confined in a one dimensional box of size 'a'. Obtain Eigen values and normalized wave function for this particle. [8]
- Q.6 (a) What do you mean by the word coherence? Explain temporal and spatial coherence. Give example of one experiment each which demonstrate temporal and spatial coherence. [6]
- (b) The distance between a monochromatic source of light and a double slit is 2 meter. The wavelength of light is  $6 \times 10^{-7}$  m. The separation of  $S_1$   $S_2$  is 2 mm. What should be the size of the source of light so that spatial coherence is maintained between  $S_1$  &  $S_2$ ? [4]
- (c) Show that the numerical aperture of a step index fiber is given by  $N.A = n_1 \sqrt{2\Delta}$ , where symbol have their usual meaning? [6]
- Q.7 (a) Describe the construction and working of He-Ne laser. What is the role of He? Give some important applications of this laser. [8]
- (b) Discuss the construction of hologram and reproduction of image from a hologram. In brief, discuss applications of a hologram. [8]