6 (a) Describe the construction, working and application of Nicol prism.

(b) Discuss the He-Ne laser with necessary diagrams. Give its superiority over ruby laser.

7 (a) Explain single mode and multimode fibers. Also give the characteristics of each type of mode.

(b) Explain the process of a hologram construction with necessary diagrams. Also give some applications of hologram.

Physical Constants

Mass of electron	$m_e = 9.1\times10^{-31}$ kg
Speed of Light	$c = 3\times10^{8}$ m/s
Plank's constant	$h = 6.63\times10^{-34}$ J-s
Mass of Proton	$m_p = 1.67\times10^{-27}$ kg
Permeability of free space	$\mu_0 = 4\pi\times10^{-7}$ H/m
Permittivity of free space	$\varepsilon_0 = 8.854\times10^{-12}$ F/m
Avogadro's number	$N = 6.023\times10^{23}$ per mole

Printed Pages : 4

NAS-101

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 199123

Roll No.

B. Tech.

(SEM. I) (ODD SEM.) THEORY EXAMINATION, 2014-15

ENGINEERING PHYSICS - I

Time : 2 Hours] [Total Marks : 50

Note : Attempt questions from each Section as per instructions.

SECTION - A

1 Attempt **all** parts of this question. Each part carries 2 marks. **(5×2=10)**

(a) What are inertial and non-inertial frames of reference ?

(b) What is double refraction ?

(c) Why are fringes circular in Newton's ring experiment ? Explain.

(d) What is stimulated emission of radiation in a laser ?

(e) What do you know about acceptance angle and cone in a fiber ?

SECTION - B

2 Attempt any **three** parts of this question. **(3×5=15)**

Each part carries **5** marks.

(a) Calculate the work done to increase speed of an electron of rest energy 0.5 MeV from 0.6c to 0.8c.

(b) An electron is bound in one dimensional potential box which has width 2.5×10^{-10} m. Assuming the height of the box to be infinite, calculate the lowest two permitted energy values of the electron.

(c) Newton's rings are observed by keeping a spherical surface of 100 cm radius on a plane glass plate. If the diameter of the 15^{th} bright ring is 0.590 cm and the diameter of the 5^{th} ring is 0.336 cm, what is the wavelength of light used ?

(d) Find out if a diffraction grating will resolve the lines 8037.20 Å and 8037.50 Å in the second order given that the grating is just able to resolve two lines of wavelengths 5140.34Å and 5140.85 Å in the first order.

(e) If refractive indices of core and cladding of an optical fiber are 1.50 and 1.45 respectively determine the values of numerical aperture, acceptance angle and critical Angle of the fiber.

SECTION - C

3 Attempt any **one** part of all questions. Each question carries **5** marks. **(5×5=25)**

(a) Deduce the Lorentz transformation equations from Einstein's postulates. Also show that at low velocities, the Lorentz transformations reduce to Galilean transformations.

(b) Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate.

4 (a) Explain group velocity. Establish a relation between group velocity and phase velocity and show that these velocities are equal in non-dispersive medium.

(b) Explain Heisenberg's uncertainty principle? Describe Heisenberg's gamma ray microscope.

5 (a) Describe and explain the formation of Newton's rings in reflected monochromatic light. Prove that in reflected light the diameters of bright rings are proportional to the square roots of odd natural numbers.

(b) Discuss the phenomenon of diffraction at a single slit and show that the relative intensities of the successive maximum are nearly 1: $4/9\pi^2$:$4/25\pi^2$ .....