

**Advanced Physics**

P. Pages : 2

Time : Two Hours

**NKT/KS/17/7203**

Max. Marks : 40

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Assume suitable data whenever necessary.
  7. Illustrate your answers whenever necessary with the help of neat sketches.
  8. Use of non programmable calculator is permitted.

List of constant :

- i) Velocity of light  $C = 3 \times 10^8$  m/sec
- ii) Charge of electron  $e = 1.602 \times 10^{-19}$  C
- iii) Mass of electron  $m = 9.11 \times 10^{-31}$  kg
- iv)  $1 \text{ amu} = 1.67 \times 10^{-27}$  kg
- v) Mass of proton  $= 1.67 \times 10^{-27}$  kg

1. a) Explain in brief construction and working of Ruby Laser with the help of suitable diagram ? [www.rtmnuonline.com](http://www.rtmnuonline.com) 4
- b) Explain the terms : 3
  - i) Absorption
  - ii) Spontaneous Emission
  - iii) Stimulated Emission
- c) White light has frequency range from  $0.4 \times 10^{15}$  Hz to  $0.7 \times 10^{15}$  Hz . Find the coherence time & coherence length. 3

**OR**

2. a) What is thin film ? Derive the expression for fringe width  $\beta$  in the interference pattern of wedge shaped film ? 4
- b) What is Antireflection coating ? Deduce an expression for minimum thickness of antireflecting coating ? 3
- c) In a Newton's ring experiment the diameter of the 15<sup>th</sup> ring was found to be 0.59 cm and that of the 5<sup>th</sup> ring was 0.336 cm. If the radius of the plano convex lens is 100 cm. Calculate the wavelength of light used. 3
3. a) Describe motion of electron when projected at an acute angle with the direction of uniform electric field and determine : 4
  - i) Time of flight.
  - ii) Range of charge particle.

- b) Show that the radius of orbit of a charged particle moving at right angles to magnetic field is proportional to its momentum ? 3
- c) An electron beam passes through a magnetic field  $2 \times 10^{-3} \text{ Wb/m}^2$  and an electric field of  $3.4 \times 10^4 \text{ V/m}$ , both fields being normal to each other and acting simultaneously in the same region. The path of electrons remains unchanged. Calculate the electron speed ? 3

**OR**

4. a) How can a charged particle be made to travel a helical in path uniform magnetic field ? Obtain an expression for pitch of this helix ? 4
- b) Show that electron describe a parabolic path when it enters in uniform transverse electric field. 3
- c) An electron with a velocity of  $4.6 \times 10^7 \text{ m/s}$  enters a uniform magnetic field of induction 0.045 Tesla perpendicular to the field lines. Determine the Lorentz force acting on the electron and radius of the circle in which it moves. 3
5. a) Draw block diagram of CRO. How intensity of electron beam is controlled in CRO. 4
- b) Explain Bethe's law. 3
- c) A cyclotron with its disc of radius 150 cm has a magnetic field of  $0.60 \text{ Wb/m}^2$ . Calculate the maximum energy to which proton can be accelerated. 3

**OR**

6. a) Describe the construction & working of cyclotron. Obtain the resonance condition for cyclotron. 5
- b) What is synchronization in CRO. 2
- c) In Bain bridge mass spectrometer the electric field used is  $8 \times 10^{14} \text{ V/m}$ , the magnetic field common to both places is  $0.20 \text{ Wb/m}^2$ . If the ion source consists of singly ionized neon isotopes of atomic masses 20 & 22, calculate the linear separation of lines on photographic plate. 3
7. a) Define acceptance angle. Deduce an expression for acceptance angle of optical fibre. 4
- b) Differentiate between step index fibre and grade index fibre. 3
- c) Find the fractional refractive index & numerical aperture for an optical fibre with refractive indices of core and cladding as 1.5 & 1.49 respectively. 3

**OR**

8. a) Describe any one method of synthesis of Nano materials. 4
- b) Write short note on Graphene. 3
- c) Write down the important application of Nano materials. 3

\*\*\*\*\*