B.E. All Branches Second Semester (C.B.S.) / B.E. (Fire Engineering) Second Semester

Advanced Physics

P. Pages : 2 **NRJ/KW/17/4343/4397**

Time : Two Hours * 0 1 0 9 * 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 constants.

1) Velocity of light C = $3x10^{8}$ m/sec.
2) Charge on electron e = $1.602x10^{-19}$C
3) Mass of electron m = $9.1x10^{-31}$kg.
4) Mass of proton m_p = $1.67x10^{-27}$kg.
5) 1 amu = $1.67x10^{-27}$ kg.

1. a) Explain **3**
i) Metastable state ii) Population Inversion
iii) Stimulated Emission

b) Explain the working of He-Ne LASER with the help of energy level diagram. **4**

c) Compute the coherence length of yellow light with 5890 Aº in 10^{-12} sec pulse duration. Find also the bandwidth. **3**

OR

2. a) What is antireflection coating? Obtain an expression for minimum optical thickness of the film to act as an antireflection coating. **4**

b) Deduce an expression for fringe width in case of wedge shaped thin film. **3**

c) In Newton's rings experiment, the diameter of n^{th} ring and $(n+14)^{th}$ rings are 4.2 mm and 7 mm respectively. Radius of planoconvex lens is 1 m. Calculate the wavelength of light used. **3**

3. a) Discuss the motion of an electron projected into the transverse uniform Electric Field. **4**

b) Show that the radius of charged particle moving at right angle to the magnetic field is proportional to its momentum. **3**

c) Determine the velocity of ions that pass undeflected through crossed E and B fields for which E = 7.7 kv/m and B = 0.14 T. **3**

OR

4. a) Show that kinetic energy of the particle remains constant when electron is fired in a uniform magnetic field. **3**

b) Obtain an expression of radius and pitch of the helical path described by electron when it enters uniform magnetic field making an acute angle with the field direction. **4**

c) An electron is projected at an angle of 37° to the horizontal at an initial speed of 4.5×10^5 m/sec in a region of a uniform electric field of intensity 200 N/C oriented vertically upward. Find the acceleration and Range of electron. **3**

5. a) Explain Bethe's law of electron refraction. **3**

b) Draw the block diagram of CRO. Explain how the intensity of electron beam is controlled in CRO. **4**

c) Calculate the magnetic field that must be applied to cyclotron dees which accelerates proton up to 4 MeV. The maximum radius of the particle orbit is 75cm. **3**

OR

6. a) Explain construction and working of cyclotron. **4**

b) Discuss construction and working of velocity selector to produce the mono-velocity beam of charged particles. **3**

c) The electric field between the plates of the velocity selector in a Bainbridge mass spectrometer is 1.2×10^5 v/m and magnetic field in both regions is 0.6T. A stream of singly charged neon ions moves in a circular path of radius 7.28 cm in magnetic field. Determine mass number of neon isotope. **3**

7. a) Deduce an expression for Acceptance angle and Numerical aperture of an optical fiber. **4**

b) What is index profile of optical fibers. Classify optical fibers on the basis of index profile. **3**

c) A glass clad fibre is made with core glass of R.I. 1.5 and cladding is doped to give fractional index difference of 0.0005. Find the cladding index and value of acceptance angle. **3**

OR

8. a) What are the approaches used for the synthesis of Nano-materials? Describe any one method. **4**

b) Write short note on **3**
i) Zeolite ii) Graphene

c) How the properties of nanomaterials differ from bulk materials? **3**

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