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

Advanced Physics Paper - II

P. Pages : 2 **KNT/KW/16/7203**

Time : Two Hours * 0 0 8 5 * 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. Due credit will be given to neatness and adequate dimensions.
7. Assume suitable data whenever necessary.
8. Illustrate your answers whenever necessary with the help of neat sketches.
9. Use of non programmable calculator is permitted.

List of constants.

1) Velocity of light 'c' = 3×10^8 m/s.
2) Charge of electron 'e' = 1.602×10^{-19} c
3) Mass of electron 'm' = 9.11×10^{-31} kg
4) Mass of proton 'm_p' = 1.67×10^{-27} kg

1. a) Explain construction and working of Ruby laser with the help of energy level diagram. **4**

b) Explain the terms. **3**
i) Spontaneous emission.
ii) Stimulated emission.
iii) Population Inversion.

c) Compute the coherence length of yellow light with 5893 Å in 10^{-12} second pulse duration. Find also the bandwidth. **3**

OR

2. a) What do you understand by antireflection coating? Deduce an expression for minimum thickness of antireflection coating. **3**

b) Obtain an expression for fringe width in the interference pattern of wedge shaped film. Explain why the fringe at the apex of the wedge is always dark. **4**

c) In Newton's Rings Experiment, diameter of 10^{th} dark ring due to wavelength 6000 Å in air is 0.5 cm. find the radius of curvature of lens. **3**

3. a) Discuss motion of charged particle projected into uniform electric field at acute angle with the field direction. Obtain an expression for Range, time of flight and maximum height attained by the particle. **4**

b) Explain the working of velocity selector. **3**

c) An electron having velocity 10^6 m/s experiences a maximum force of 1.6 x 10^{-14} N when it enters a uniform magnetic field. What is the magnitude of the magnetic field? **3**

OR

4. a) Explain why charged particle perform helical path in uniform magnetic field? Derive expression for pitch of the helix. **4**

b) Show that electron traces a parabolic path when it enters uniform transverse electric field. **3**

c) A proton accelerates from rest in a uniform electric field of 400 v/m. After 't' seconds its speed is 3 x 10^6 m/s. Find. **3**

i) The acceleration of a proton.
ii) Time 't'
iii) How much is the distance travelled in the time 't'.

5. a) State the law that governs the refraction of electrons. In what way it resembles the Snell's law and in what way it differs from it. **3**

b) Draw the block diagram of CRO. How can intensity and focussing of the trace on the screen can be controlled. **5**

c) Calculate the frequency of ac potential that must be applied to cyclotron dees in which protons are accelerated. Given magnetic flux density = 3 wb/m^2. **2**

OR

6. a) In cyclotron obtain the expression for. **4**
i) Resonance condition and
ii) Maximum kinetic energy gain, for a charged particle.

b) Explain the role of acquadag coating in cathode ray tube. **2**

c) The electric field between the plates or velocity selector is 150 v/cm and magnetic field is 0.5T. If the source contains the isotopes of magnesium Mg^{24} and Mg^{25} and the ions are singly charged. Find the distance between the lines formed by isotopes on photographic plate or Bainbridge Mass Spectrograph. **4**

7. a) Derive an expression for acceptance angle in terms of refractive index of the core and cladding. **3**

b) Explain **4**
i) Optical fibre as a sensor.
ii) Types of optical fibre on the basis of R.I.

c) Calculate the refractive indices of the core and cladding of a fibre. Given Numerical Aperature (NA) = 0.22 and Δ = 0.012 where Δ is the fractional refractive index change. **3**

OR

8. a) How does the properties of nanomaterials differ from bulk materials.? **4**

b) State the applications of Nano-materials. **3**

c) Describe any one method of synthesis of Nano-materials. **3**

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