

Faculty of Engineering & Technology
Second Semester B.E. (C.B.S.) Examination
ADVANCED PHYSICS
Paper—II

Time—Two Hours]

[Maximum Marks—40

INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
- (2) Solve **FOUR** questions as follows :
 Que. No. 1 **OR** Que. No. 2
 Que. No. 3 **OR** Que. No. 4
 Que. No. 5 **OR** Que. No. 6 rtmnuonline.com
 Que. No. 7 **OR** Que. No. 8
- (3) Assume suitable data wherever necessary.
- (4) Illustrate your answers wherever necessary with the help of neat sketches.
- (5) Use of non-programmable electronic calculator is permitted.

List of Constants :

- (1) Velocity of light 'c' = 3×10^8 m/s
- (2) Charge of an 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
- (5) 1 amu = 1.67×10^{-27} kg

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1. (a) Explain the terms :
 (i) Population Inversion
 (ii) Meta stable state rtmnuonline.com
 (iii) Stimulated emission. 3
- (b) Explain the working of He-Ne laser with the help of neat energy level diagram. 4
- (c) A Ruby laser produces the light of wavelength 6943 Å at 27°C in 10^{-12} sec pulse duration. Calculate coherence length and bandwidth. 3

OR

2. (a) Derive an expression for fringe width in interference pattern obtained in wedge shaped thin film. How this phenomenon is used for testing the optically flat surface ? 5
- (b) What is antireflection coating ? Why do lenses coated with thin film improve transmission of light ? 3
- (c) Newton's rings are observed in reflected light of wavelength 590 nm. The diameter of the 10th ring is 0.6 cm. Find the radius of the curvature of the lens. rtmnuonline.com 2
3. (a) Show that the trajectory made by an electron follows the equation $y = kx^2$, when it enters into a transverse uniform electric field. 4
- (b) Explain the working of a velocity selector with the help of necessary diagram. 3
- (c) An electron is accelerated through a potential difference of 3 kV and enters a uniform magnetic field of 0.03 tesla acting normal to the direction of electron motion. Determine the radius of the path and frequency of oscillation of electron. 3

OR

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4. (a) Obtain the expression for radius and pitch of helical path described by the charged particle when it enters the uniform magnetic field making an acute angle with the direction of magnetic field. 4
- (b) Explain why slower particles and faster particles require the same time for completing one rotation in magnetic field. **rtmnuonline.com** 3
- (c) A proton accelerates from rest in a uniform electric field of 500 V/m. At some later time, its speed is 2.5×10^6 m/s. Find :
- (i) Acceleration of Proton.
- (ii) The time taken by the proton to reach above speed.
- (iii) The distance travelled by proton during this time. 3
5. (a) Draw neat and clean diagram of Cathode Ray Oscilloscope. Explain the working of Time-base circuit in brief. **rtmnuonline.com** 4
- (b) Explain the Bethe's law with necessary diagram and state its similarities with Snell's law. 3
- (c) The element Tin is being analysed in a Bainbridge mass spectrograph. The isotopes present are of masses 116, 118 and 120. The electric field between the plates of velocity selector is 20 kV/m and the magnetic field common to both the velocity selector and analyzing chamber is 0.25 wb/m^2 . What is the spacing between the masses produced on the Photographic plate by the singly charged ions of Tin 116 and 120 ? 3

OR **rtmnuonline.com**

6. (a) With a well labelled diagram, explain the principle, construction and working of a cyclotron. Obtain the resonance condition for cyclotron. 5
- (b) What is synchronization ? **rtmnuonline.com** 2
- (c) Electrons are accelerated under a potential of 250 V enter the electric field at an angle of incidence of 50° and get refracted through an angle of 30° . Find the potential difference between the two regions. 3
7. (a) Explain the classification of optical fibres with well labelled diagrams. 3
- (b) Write short notes on the following :
- (i) Total internal reflection **rtmnuonline.com**
- (ii) Attenuation in optical fibre. 4
- (c) Calculate the numerical aperture and acceptance angle for an optical fibre whose core R.I. is 1.48 and cladding R.I. is 1.39 3
- OR**
8. (a) What are nano materials ? Explain why nano materials exhibit different physical and chemical properties. 3
- (b) How are nano materials synthesized ? Describe any one method. **rtmnuonline.com** 4
- (c) What are Graphenes ? Give their applications. 3