Faculty of Engineering & Technology

Second Semester B.E. Examination

ADVANCED PHYSICS

Time—Two Hours] [Maximum Marks—40

INSTRUCTIONS TO CANDIDATES

(1) All questions carry equal marks.
(2) Solve **FOUR** questions as follows : Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.
(5) Use of non-programmable calculator is permitted.

List of Constants :

Velocity of light 'v' = 3×10^{8} m/s

Charge of electron 'e' = 1.602×10^{-19} C

Mass of electron 'm' = 9.11×10^{-31} kg

Mass of proton 'm_p' = 1.67×10^{-27} kg.

1. (a) Explain with suitable energy level diagram the working of He-Ne laser. 5

(b) Why four level pumping is more efficient than three level pumping ? 3

(c) Why in Newton's ring experiment the central spot is dark ? 2

OR

2. (a) Deduce expression for fringe width and wedge angle in case of wedge shaped thin film. 4

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(b) What is Antireflection Coating ? Obtain condition for minimum thickness for such a coating. 4

(c) White light has frequency range from 0.4×10^{15} Hz to 0.7×10^{15} Hz. Find the coherence time and coherence length. 2

3. (a) Discuss the motion of an electron projected into the transverse uniform electric field. 4

(b) In a transverse uniform magnetic field show that the radius of curvature of path tranversed by the charged particle is proportional to its momentum. 3

(c) An electron with a velocity of 4.6×10^{7} m/s enters a uniform magnetic field of induction 0.085 T perpendicular to the field lines. Determine the Lorentz force acting on the electron and radius of the circle in which it moves. 3

OR

4. (a) Describe motion of electron when it is projected at an angle with direction of Uniform Magnetic Field. 4

(b) Explain the working of velocity filter. 3

(c) An electron shot in Uniform Magnetic Field at an angle of 60° moves in spiral of diameter 10 cm and with a period of 6×10^{-5} sec. Determine magnetic induction and electron velocity. 3

5. (a) Draw block diagram of CRO. Explain function of time base generator. 4

(b) Explain the working of Cyclotron with the help of neat diagram. 3

(c) In a Bainbridge Mass Spectrograph the electric field used is 8×10^{4} V/m, the magnetic field common to

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both places is 0.2 Wb/m^2. If the ion source consists of singly ionised neon isotopes of atomic masses 20 and 22, calculate linear separation of lines formed on photographic plate. 3

OR

6. (a) Explain construction and working of Bainbridge Mass Spectrograph. 5

   (b) Explain Bethe's Law. 3

   (c) Protons are accelerated in a small cyclotron. The magnetic field strength is 1.3 Wb/m^2. What must be the frequency of the oscillator supplying power to Dees ? 2

7. (a) What is an optional fiber ? Deduce the expession for acceptance angle of an optical fibre. 1+4

   (b) Differentiate between step index and graded index fibre on the basis of Index Profile. 3

   (c) The numerical aperture of an optical fibre is 0.5 and refractive index of the core is 1.54. Find the refractive index of the cladding. 2

OR

8. (a) Explain any one method of preparation of nanomaterials. 4

   (b) Write down the important applications of Nanomaterial. 3

   (c) Write short note on Graphene. 3