

VKR/KS/13/6444

Faculty of Engineering & Technology

Second Semester B.E. Examination

ADVANCED PHYSICS

Time—Two Hours]

[Maximum Marks—40

INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
- (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 electronic calculator is permitted.

List of Constants :

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

1. (a) Explain the terms :

(i) Coherence

(ii) Metastable state

(iii) Stimulated emission.

3

(b) Explain construction, working and limitation of Ruby Laser with neat energy level diagram.

5

(c) Find the thickness of the water film with refractive index of 1.33 formed on a glass window pane to act as a non-reflecting film. Given $\lambda = 5500 \text{ \AA}$.

4135.33

2

OR

2. (a) What is thin film ? Obtain an expression for fringe width in wedge shaped thin film.

1+3

(b) In Newton's ring experiment why :

(i) Plano convex lens has large radius of curvature.

(ii) The rings get closer away from the centre.

3

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

3

3. (a) Prove that the path travelled by an electron in a uniform transverse electric field is a parabola.

3

✓ (b) Show that the radius of charged particle moving at right angle to the magnetic field is proportional to its momentum. 4

✓ (c) An electron beam passes through magnetic field of $2 \times 10^{-3} \text{ Wb/m}^2$ and electric field of $3.4 \times 10^4 \text{ V/m}$ both acting simultaneously at the same point. The path of the electron remains unchanged. Calculate the electron speed. 3

OR

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

(b) Explain the function of velocity filter. 3

(c) An electron is projected with an initial velocity of 10^7 m/s and at an angle of 30° to the horizontal into a uniform electric field of 5000 V/m . Find the maximum height to which electron rises vertically and the time taken by the particle to reach maximum height. 3

5. ✓ (a) What is Bethe's law ? Discuss similarities and differences between Bethe's law and Snells' law. 3

✓ (b) Draw block diagram of CRO and explain how intensity of trace is controlled on screen. 4

- (c) A cyclotron with its dees of radius 2 m has a magnetic field of 0.75 Wb/m^2 . Calculate the maximum energy to which a proton can be accelerated. 3

3.169×10^7

OR

6. (a) Describe the working principle of a Bainbridge mass spectrograph with a neat sketch. 5
- (b) Explain the function of aquadag coating on the screen of CRT. 2
- (c) An electron beam enters from a region of potential 75 V into a region of potential 100 V; making an angle of 45° with the direction of electric field. Find the angle through which the beam refracts. 3

7. (a) What is an optical fibre ? Explain the principle involved in its working. 4
- (b) Discuss the working of optical fibre as a temperature sensor. 3
- (c) Calculate numerical aperture for a fibre cable with a core index of refraction of 1.45 and cladding index of 1.30. 3

0.011

OR

8. (a) How does the properties of nanomaterials differ from bulk materials ? 4
- (b) What are Zeolites ? Give their applications. 3
- (c) State the applications of Nano-materials in Engineering. 3