

## ENGINEERING PHYSICS [0BSBS102]

### Model ANSWER

Q.NO	Marking Scheme
Q1A	<p>Derive an expression for the diameter of Newton's bright ring and dark ring. In a Newton's ring experiment the diameter of 10<sup>th</sup> dark ring due to wavelength 6000 Å in air is 0.5 cm. Find the radius of curvature of the lens.</p> <p><b>Diagrams-02 Marks, Explanation-04 Marks, Solution of example with correct answer- 02 Marks</b></p>
Q1B	<p>What is the phenomenon of polarization of light? Explain the types of polarization with neat diagram.</p> <p>A tube of length 20.5 cm containing sugar solution of specific rotation 66° shows optical rotation of 7°. Calculate strength of the sugar solution.</p> <p><b>Phenomenon Explanation-02 Marks, Explanation of any two type -02 Marks each Solution of problem with correct answer- 02 Marks</b></p>
Q1C	<p>Explain the construction and working of a He-Ne laser with energy level diagram. What are merits and demerits of He-Ne laser?</p> <p><b>Construction with diagram-03 Marks and Working with Diagram-03 Mark, Merits and demerits-02 Marks</b></p>
Q2A	<p>Explain numerical aperture (NA) and fractional refractive index change (<math>\Delta</math>). Find the relation between numerical aperture and fractional refractive index change.</p> <p>Calculate the Fractional refractive index change for a given optical fibre if the refractive indices of core and cladding are 1.563 and 1.498 respectively.</p> <p><b>Explanation of each term-02 Mark, Relation between terms-02 Marks, Solution of problem with correct answer- 02 Marks</b></p>
Q2B	<p>Define the packing factor and state its formula. Obtain the packing factor of SC, BCC and FCC lattice. Copper has FCC structure and its density is 8.98 gm/cm<sup>3</sup>. Find the atomic radius. Given that the atomic weight of copper = 63.54.</p> <p><b>Definition and Formula-01 Mark, Finding Packing Density- SC 01 Mark, BCC 02 Marks and FCC 02 Marks. Solution of problem with correct answer- 02 Marks</b></p>
Q3A	<p>What are matter waves? State the properties of matter waves.</p> <p><b>Definition-01 Mark, Any 5 properties – 5 Marks (1 Mark for each)</b></p>
Q3B	<p>Define wave function. What is meant by normalized wave function? State the Properties of wave function 'Ψ'.</p> <p><b>Definition and explanation-03 Mark, properties – 3 Marks (1 Mark for each)</b></p>
Q3C	<p>State the Heisenberg uncertainty principle and derive its mathematical form for position and momentum of a particle.</p> <p><b>Statement of Principle-1 Mark and Complete Derivation- 5 Marks.</b></p>
Q3D	<p>Derive an expression for Schrodinger time independent wave equation.</p>

	<b>Complete Derivation- 6 Marks.</b>
Q4A	<p>What is Magnetostriction effect? Explain the construction &amp; working of Magnetostriction oscillator.</p> <p><b>Effect- 01 Mark, Construction with diagram-04 Marks and Working-03 Marks</b></p>
Q4B	<p>What are ultrasonic waves? State the properties of ultrasonic waves. Calculate natural frequency of 40 mm length of pure iron rod. Given the density of pure iron is <math>7.25 \times 10^3 \text{ kg/m}^3</math> and Young's modulus is <math>115 \times 10^9 \text{ N/m}^2</math>. Can you use it in magnetostriction oscillator to produce ultrasonic waves?</p> <p><b>Defination- 01 Mark, Any five properties-5 Marks, and Solution of problem with correct answer- 02 Marks.</b></p>
Q4C	<p>What is crossed field configuration? Determine the velocity of the electron in crossed field without any deviation with neat diagram. An electron beam passes through a magnetic field of <math>2 \times 10^{-3} \text{ wb/m}^2</math> and an electric field of <math>4 \times 10^4 \text{ V/m}</math> acting simultaneously. If the path of electron remains undeflected, determine the speed of the electron.</p> <p><b>Defination- 01 Mark, Explanation with diagram and expression-05 Marks, Solution of problem with correct answer- 02 Marks.</b></p>
Q5A	<p>How does variation of Fermi energy in extrinsic semiconductors occur depending on impurity concentration? A copper strip 2 cm wide and 1 mm thick is placed in a magnetic field with <math>B=1.5 \text{ wb/m}^2</math>. If a current of 200 A is set up in strip, calculate Hall Voltage that appears across the strip. Assume <math>RH = 6 \times 10^{-7} \text{ m}^3/\text{C}</math>.</p> <p><b>Diagram-02 Marks for each type and Explanation -02 Marks, Solution of problem with correct answer- 02 Marks.</b></p>
Q5B	<p>State the Hall effect and obtain an expression for Hall field, Hall voltage and Hall coefficient.</p> <p><b>Statement-01 Mark, diagram-01 Mark, Explanation with expression of each-02 Marks each</b></p>
Q6a	<p>Write a note on the applications of qubits.</p> <p><b>Any 6 correct applications of qubits -6 Marks</b></p>
Q6b	<p>Explain the motion of electron in transverse electric field. Obtain an expression and show that the electron moving with uniform velocity in transverse electric field traces parabolic path.</p> <p><b>Explanation with diagram-03 Marks, Expression -03 Marks</b></p>
Q6C	<p>Draw and explain the diagrams for dependence of Fermi level on temperature in extrinsic semiconductors.</p> <p><b>Diagram-02 Marks for each type and Explanation -02 Marks</b></p>
Q6D	<p>What are the applications of magnetic materials.</p> <p><b>Any six correct applications-06 Marks (One Mark Each)</b></p>