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UNIT-1

1. a) State and explain the Principle of superposition of waves. - 4M
b) Explain the formation of Newton's rings and obtain an expression for the diameter of the dark rings in reflected system..- 6M
2. a) In Newton's rings experiment, diameter of the tenth dark ring due to wavelength $6000\text{\AA}$ in air is 0.5 cm. Find the radius of curvature of the lens.- 4 M
b) If the air film in the Newton's rings apparatus is replaced by an oil film, then how does the radius of the rings change? Explain. - 6M
3. a) What are the necessary conditions to get clear and distinct interference fringes - 4M
b) Describe principle ,construction and working of Michelson Interferometer. - 6M
4. a) Explain the colours in a thin film when exposed it to a sun light - 4M
b) Explain why the centre of Newton's rings is dark in the reflected system. Why are they circular? 6M
5. a) Distinguish between Monochromatic and Polychromatic light sources, Give one example for each
b) With a ray of diagram, discuss the theory of thin films and the condition constructive and destructive interference in the case of reflected light.—7M
6. a) Describe principle ,construction and working of Febry-Perot Interferometer. - 6M
b) In Newton's rings experiment, diameter of 10^{th} dark ring due to wavelength $6000\text{ \AA}$ in air is 0.5 cm. Find the radius of curvature of lense.

UNIT—II

1. a) What are the types of diffraction and give the difference between them ? 4 M
b) Obtain the condition for primary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima - 6 M
2. a) What is the difference between interference and diffraction -4M
b) Explain the diffraction due to two parallel slits and obtain the Intensity of light on the screen.—6M
3. a) Define the grating and Explain with necessary theory, the Fraunhofer diffraction due to 'N'parallel slits.— 6 M
b) Calculate the maximum number of order possible for a transmission grating - 4 M
4. a) What happens to the diffraction fringes, if the slit width is reduced in single slit experiment? Explain why? - 6 M
b) A grating has 6000 lines/cm.Find the angular separation between two wavelengths of 500 nm and 510 nm in 3^{rd} order - 4M

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5. a) What is meant by Diffraction of light? Explain it on the basis of Huygen's wave theory ? 4 M
- b) Explain the theory of plane transmission grating and derive equations for maxima and minima.- 6M
6. a) Define resolving power of grating and explain Rayleigh criterion for resolution and determine the resolving power of the Telescope - 6 M
- b) How many orders will be visible, if wave length of light is 5000 Å ? Given that the number of lines per centimeter on the grating is 6655. - 4 M

UNIT – III

1. a) What is a half wave plate and Quarter wave plate? Deduce an expression for its thickness-6 M
- b) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. Here $\mu_e = 1.553$ and $\mu_o = 1.544$. - 4 M
2. a) Distinguish between polarized and unpolarized lights –3M
- b) State and explain Brewster's law? Discuss how the plane, Circular and Elliptical
3. a) Write a note on double refraction? 4M
- b) Explain the principle, construction and working of a Nicol prism.-6M
4. a) Write the difference between Spontaneous and Stimulated Emissions.– 4M
- b) Explain the working of Ruby laser with the help of neat energy level diagram.– 6M
5. a) What is population inversion and how can it be achieved ?.- 4 M
- b) Explain the working of He-Ne gas laser with the help of neat energy level diagram.- 6 M
6. a) Explain Einstein's coefficients. Derive the relation between them.-5M
- b) What are the characteristics and applications of LASER beam.-5M

UNIT-IV

- 1 (a) Define sound absorption and absorption coefficient.- 3 M
- (b) What is Eyring's formula for the reverberation time. – 2 M

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(c) How will you measure the absorption coefficient of a material ?— 5 M 2

(a) Explain the Sabine formula.- 3 M

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- (b) Calculate the rate of absorption energy of reverberation time - 7 M
- 3 (a) Explain the terms 'Reverberation' and 'Reverberation time'. On what factors does the Reverberation time depend? - 4 M
(b) Derive Sabine's formula for 'Reverberation time'. - 6 M
- 4 (a) What is Magnetostriction effect? - 2 M
(b) Describe the production of ultrasonic waves by Magnetostriction method - 8M
- 5 (a) What is Piezoelectric effect? - 2 M
(b) Describe the production of ultrasonic waves by Piezoelectric method - 8M
- 6 (a) What are ultrasonic waves? Write the properties of ultrasonic waves? - 5 M
(b) What are ultrasonic transducers and explain their types. - 5 M
7. Explain Non-Destructive Testing system (NDT) - 10 M

UNIT- V

- 1 (a) Identify whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason - 3 M
(b) Describe the BCC sub lattice and calculate its atomic packing fraction - 7 M
- 2 (a) Define crystal lattice, unit cell, lattice parameter and coordination number. - 4 M
(b) Describe the FCC sub lattice and calculate its atomic packing fraction - 6 M
- 3 (a) Describe the Seven (7) crystal systems with neat diagrams. - 4 M
(b) Obtain the expression for Packing Fractions of SC crystals. - 6M
- 4 (a) Derive an expression for inter-planar distance between the parallel planes (h k l) - 7 M
(b) The distance between (110) planes in a BCC structure is 0.203 nm. What is the size of the unit cell and radius of the atom? - 3 M
- 5 (a) What are miller indices? How are they obtained?
(b) Draw the crystal planes having Miller indices (110), (102) and (211) - 3 M
- 6 (a) State and explain Bragg's law of X-Ray Diffraction.
(b) Silver has FCC structure and its atomic radius is 1.441 Å. Find the spacing of (220) planes - 4 M
- (c) Iron crystallizes in BCC structure. Calculate the lattice constant, given that the atomic weight and density of iron are 55.85 and 7860 kg/m³. - 4 M

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7 (a) Explain the terms (1) Mass defect (2) Binding Energy (3) Packing fraction.

(b) Distinguish between Nuclear Fission and Fusion.

8 (a) What is a Nuclear Reactor? Describe the fast breeder Reactor. What are its advantages and disadvantages?

(b) Explain what is meant by Nuclear Fusion and Nuclear Fission?

UNIT—VI

1 (a) Explain the classification of magnetic materials - 6M

(b) Explain the origin of Magnetic Moment – 4M

2 (a) What is Bohr Magneton? How is it related to magnetic moment of electron? – 4 M

(b) What is meant by Hysteresis of B-H curve? Explain ferro magnetic Hysteresis on the basis of domain theory – 6M

3 (a) What are Soft magnetic materials? Explain their properties. – 5 M

(b) What are Hard magnetic materials? Explain their properties. – 5 M

4 (a) Derive the relation between polarization vector(P), the electric field(E) and displacement(D) vector. - 4 M

(b) What is ionic polarization? Derive an expression for ionic polarizability of ionic crystal? - 6 M

5 (a) Explain the terms 'Dielectric breakdown' and 'Dielectric strength'. – 4M

(b) What is meant by a local field (internal field) in a solid dielectric? Derive an expression for local field for structures possessing cubic symmetry? - 6 M

6 (a) Explain electronic polarization in atoms and obtain an expression for electronic polarizability in terms of radius of atom? – 5 M

(b) What are the polar and non-polar dielectrics? Derive Clausius-Mosotti equation. – 5 M