Code No: R201103 **R20** SET - 1

I B. Tech I Semester Regular Examinations, April - 2022

ENGINEERING PHYSICS

(Com. to CE, ME & Agri. E, Pharm. E**)**

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

~~~~~~

UNIT-I

1. a) Explain the formation of colours in thin films and hence obtain the conditions for constructive and destructive interference fringe pattern. (10M)

   b) A parallel beam of sodium light of wavelength 5890×10^{-10}m is incident on a thin glass plate of refractive index 1.5, such that the angle of refraction in the plate is 60^{o}. Calculate the smallest thickness of the plate which will make it appear dark by reflection. (4M)

Or

2. a) Explain what is meant by diffraction of light. How diffraction is different from interference? (7M)

   b) Discuss Fraunhofer single slit diffraction. Draw intensity distribution curves and Obtain conditions for bright and dark fringes in single slit diffraction pattern. (7M)

UNIT-II

3. a) Describe how population inversion is very important in laser production. (2M)

   b) With the help of energy level diagram discuss the working of He-Ne laser. What are merits and demerits of He-Ne laser? (12M)

Or

4. a) Explain the principle of optical fiber. Explain Acceptance angle and derive expression for it. (10M)

   b) For an optical fiber fractional index change is 0.14 and refractive index of cladding is 1.3. Calculate refractive index of core. (4M)

UNIT-III

5. a) Obtain an expression for the internal field inside a crystalline (cubic) dielectric medium which is subjected to an external electric field of intensity E. (8M)

   b) Derive Clausius-Mosotti equation for the molar polarizability of a dielectric material with cubic crystalline structure. (6M)

Or

6. a) What is ferromagnetism? Explain the properties of ferromagnetic materials. (6M)

   b) Explain the Hysteresis curve in magnetism on the basis of domains. Distinguish between Soft and Hard magnetic materials. (8M)
~~~~~~

UNIT-IV

7. a) Define piezoelectric effect and describe the working of piezoelectric oscillator method to generate ultrasonic waves. (10M)

   b) Write notes on Acoustic grating. (4M)

Or

8. a) Mention the characteristics of acoustically good auditorium. (6M)

   b) Explain the various factors affecting the acoustics of building and give their remedies. (8M)

UNIT-V

9. a) Illustrate simple cubic, FCC and BCC crystal structures. (6M)

   b) What is space lattice? Find the packing fraction for BCC and FCC crystals. (8M)

Or

10 a) State Bragg's law of X-ray diffraction. Describe Bragg's X-ray spectrometer and explain how Braggs law can be verified. (10M)

   b) Monochromatic X-rays of wavelength 1.5Å are incident on a crystal face having an interplanar spacing of 1.6Å. Find the highest order for which Bragg's reflection maximum can be seen. (4M)

Code No: R201103 **R20** SET - 2

I B. Tech I Semester Regular Examinations, April - 2022

ENGINEERING PHYSICS

(Com. to CE, ME & Agri. E, Pharm. E)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

UNIT-I

1. a) Obtain the expressions for diameters of dark and bright rings in Newton's rings experiment and hence obtain the expression for wavelength of light used. (10M)

   b) Calculate the thickness of the thinnest film (μ=1.4) in which interference of violet component (λ=4000AU) of incident light can take place by reflection. (4M)

Or

2. a) What is meant by Diffraction of light? Explain it on the basis of Huygen's wave theory. (6M)

   b) Explain with necessary theory how wavelength of spectral line is determined using plane diffraction grating. (8M)

UNIT-II

3. a) Distinguish between Spontaneous and Stimulated emissions. (4M)

   b) Derive the relation between probabilities of Spontaneous and Stimulated emissions in terms of Einstein coefficients. (10M)

Or

4. a) Explain the construction of optical fiber. Write notes on Step Index and Graded Index fibers. (10M)

   b) The refractive indices of core and cladding of a fiber are 1.50 and 1.45 respectively. Calculate its Numerical Aperture and maximum Acceptance angle. (4M)

UNIT-III

5. a) Discuss in detail the electronic, ionic and orientational polarizations and their dependence on temperature. (6M)

   b) Deduce an expression for Lorentz field relating to a dielectric material. (8M)

Or

6. a) Distinguish between Dia, Para and Ferromagnetism. (6M)

   b) Explain the hysteresis loop observed in ferromagnetic materials. What are hysteresis losses? (8M)

UNIT-IV

7. a) What are ultrasonic waves? Mention their properties. (4M)

   b) Write an essay on production, detection and properties of ultrasonics. (10M)

Or

8. a) Define the reverberation time. Discuss the importance of reverberation time for the design of an acoustically good hall. (4M)

   b) What is the absorption coefficient? Explain two methods to determine the absorption coefficient. (10M)

UNIT-V

9. a) Explain the terms: (4M)
   (i) basis , (ii) space lattice, (iii) lattice parameters and (iv) unit cell.

   b) Show that FCC is the more closely packed than SC, BCC crystal systems. (10M)

Or

10 a) What are Miller indices? How are they determined? Sketch the following planes of a cubic unit cell: (001), (120) and (211). (10M)

   b) What is Bragg's law? Explain. (4M)

Code No: R201103 **R20** SET - 3

I B. Tech I Semester Regular Examinations, April - 2022

ENGINEERING PHYSICS

(Com. to CE, ME & Agri. E, Pharm. E)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

~~~~~~

UNIT-I

1. a) With the help of a neat diagram, describe the experimental arrangement to produce Newton's rings by reflected light. Prove that the diameter of dark rings is proportional to the square root of the natural numbers. (10M)

   b) In Newton's rings experiment, the diameter of the 5^{th} and 25^{th} rings are 0.3cm and 0.8cm respectively. If the radius of curvature of the plano-convex lense is 10cm, find the wavelength of the incident light. (4M)

Or

2. a) With the help of neat diagrams, explain how Nicol's prism is used to produce and Analyze plane polarized light. (10M)

   b) Define a quarter-wave plate and derive the expression for its thickness. (4M)

UNIT-II

3. a) Derive the relationship between the probability of spontaneous emission and stimulated emission in terms of Einstein's coefficients. (10M)

   b) Mention some important applications of lasers. (4M)

Or

4. a) What is an Optical fiber? Describe different types of fibers by giving the refractive index profiles and propagation details. (10M)

   b) The numerical aperture of an optical fiber is 0.39. if the difference in refractive index of the material of its core and cladding is 0.05, calculate the refractive index of the material of the core. (4M)

UNIT-III

5. a) What is meant by polarization in dielectrics? Derive the relation between dielectric constant and atomic polarizability. (6M)

   b) Obtain an expression for electronic polarizability in terms of radius of the atoms. (8M)

Or

6. a) Explain ferromagnetism. (4M)

   b) Explain the Hysteresis of ferromagnetic materials. How is it used to classify magnets? (10M)
~~~~~~

UNIT-IV

7. a) What are ultrasonic waves? Mention their properties. (4M)

   b) Draw a block diagram of the ultrasonic flaw detector for NDT and explain its working. Mention its advantages and disadvantages. (10M)

Or

8. a) Derive expressions for growth and decay of energy density inside a hall and deduce Sabine's formula for the reverberation time of the hall. (10M)

   b) The reverberation time is found to be 1.5 sec for an empty hall, and it is found to be 1 sec when a curtain cloth of 20 m2 is suspended at the centre of the hall. If the dimensions of the hall are 10x8x6 m^3. Calculate the coefficient of absorption of curtain cloth. (4M)

UNIT-V

9. a) Describe in detail, the seven crystal systems with diagrams. (10M)

   b) Find the lattice constant along with the volume of the unit cell of iron atom (BCC). Given the atomic radius of iron atom is equal to 0.124 Å. (4M)

Or

10 a) Derive an expression for interplanar separation in terms of Miller Indices for a cubic structure. (10M)

   b) A beam of x-rays is incident on an ionic crystal with lattice spacing 0.313 nm. Calculate the wavelength of x-rays if the first order Bragg reflection takes place at a glancing angle of $7^o48'$. (4M)

Code No: R201103 **R20** SET - 4

I B. Tech I Semester Regular Examinations, April - 2022

ENGINEERING PHYSICS

(Com. to CE, ME, Agri. E, Pharm. E)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

~~~~~~

UNIT-I

1. a) How do you obtain circular rings in Newton's rings experiment? With necessary theory explain the experimental procedure to determine the refractive index of transparent liquid by using Newton's rings method. (10M)

   b) In a Newton's rings experiment, the diameter of 10^{th} dark ring changes from 1.40cm to 1.27cm when a liquid is introduced between the lense and the plate. Calculate the refractive index of the liquid. (4M)

Or

2. a) Discuss various methods by which polarized light can be produced. (7M)

   b) What are Quarter and Half wave plates? Derive the expressions for their thickness. (7M)

UNIT-II

3. a) Explain the principle , construction and working of Ruby laser. (10M)

   b) The refractive indices of core and cladding of a optical fiber are 1.54 and 1.50 respectively. Calculate its Numerical Aperture and Acceptance angle. (4M)

Or

4. a) What are the conditions to produce total internal reflection in optical fiber. Describe structure of different types of Optical fibers with ray paths. (10M)

   b) Explain the role of optical fibers in medicine and industry. (4M)

UNIT-III

5. a) Explain the different types of polarization mechanism involved in a dielectric material. Obtain the expression for ionic polarizability. (10M)

   b) If an ionic crystal is subjected to an electric field of 1000 Vm^{-1} and the resulting polarization 4.3×10^{-8} cm^2. Calculate the relative permittivity of NaCl. (4M)

Or

6. a) Define the terms 'magnetic susceptibility' and 'magnetic induction'. What are the sources of permanent dipole moment in magnetic materials? (7M)

   b) Distinguish between dia, para and ferro magnetic materials. (7M)
~~~~~~

UNIT-IV

7. a) Discuss the method of Magnetostriction for production of Ultrasonic waves. (10M)

   b) Write notes on Acoustic grating (4M)

Or

8. a) Deduce Sabine's formula for the reverberation time of an auditorium. (10M)

   b) In a hall the area of the floor and ceiling is $100m^2$ each. The area of wall is $200m^2$. The absorption coefficients of the wall, ceiling and floor are 0.025, 0.02 and 0.55, respectively. If the volume of the hall is 475 m^3, calculate the reverberation time for the hall. (4M)

UNIT-V

9. a) What is a Bravais lattice? What are the different space lattices in the cubic system? Explain. (8M)

   b) Find the packing fraction for BCC and FCC crystals (6M)

Or

10 a) What are Miller Indices? How are they determined? Draw (111) and (110) planes in a cubic lattice. (10M)

   b) A beam of x-rays of wavelength 0.071 nm is diffracted by the (2 1 0) plane of a BCC crystal. Find the Bragg reflection angle for the second order diffraction if the interplanar spacing of the (1 1 0) plane is 0.195nm. (4M)