Code No: R161204 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ENGINEERING PHYSICS
(Com. to CE, ME, CHEM, AE, BIO, AME, Min E, PE, PCE, MET)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Explain how Newton's rings are formed. (2M)
   b) What is Fraunhofer diffraction? (2M)
   c) Define plane of polarization and vibration. (2M)
   d) What are Miller indices? (2M)
   e) Define reverberation time. (2M)
   f) Draw B-H plot for ferromagnetic material. (2M)
   g) Discuss one application of ultrasonics. (2M)

PART -B

2. a) What is a thin film? Explain the cosine law and derive the conditions at which bright and dark fringes are obtained. (10M)
   b) Light of wavelength 5893 Å is reflected at nearly normal incidence from a soap film of refractive index 1.42. What is the least thickness of the film that it will appear (i) black and (ii) bright. (4M)

3. a) Define resolving power of an optical instrument. Deduce an expression for the same in the case of telescope. (10M)
   b) Calculate the aperture of the objective of a telescope which may be used to resolve two stars separated by 4.88×10^{-6} radians for light of wavelength 6000Å. (4M)

4. a) Discuss with suitable diagrams, the principle, construction, working and theory of Helium Neon laser. Explain the role of Helium atoms in this laser. (10M)
   b) How He-Ne laser is superior to Ruby laser. Explain. (4M)

5. a) Write short notes with examples on (i) Mass defect (ii) Binding Energy. (10M)
   b) Derive Bragg's law of x-ray diffraction. (4M)

6. a) Derive Sabine's formula for reverberation time of a hall. (10M)
   b) Explain the working of ultrasonic flaw detector. (4M)

7. a) Classify the magnetic materials based on the field and temperature. (10M)
   b) Obtain Clasius-Mossotti equation. (4M)

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3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) State the superposition theorem. (2M)
   b) Define resolving power of an optical instrument. (2M)
   c) Discuss various pumping methods used in the Lasers for obtaining population inversion. (2M)
   d) Define (i) Unit cell (ii) Co-ordination number (2M)
   e) A conference room has total volume of 2000 m^3. The magnitude of total absorption within the conference room is 100 sabine. Calculate the reverberation time. (2M)
   f) Discuss one application of ferromagnetic material. (2M)
   g) How can you define dielectric strength? (2M)

PART -B

2. a) Explain the theory of Newton's rings. Derive an expression for the radius of the n^{th} bright ring in Newton's rings. (10M)
   b) In a Newton's rings experiment, the diameter of the fifth dark ring is reduced to half of its value after introducing a liquid below the convex surface. Calculate the refractive index of liquid. (4M)
3. a) Obtain the condition for principal maximum in Fraunhofer diffraction due to single slit and derive an expression for width of the central maximum. (10M)
   b) A single slit of width 0.14 mm is illuminated normally by monochromatic light and diffraction bands are observed on a screen 2 m away. If the centre of the second dark band is 1.6 cm from the middle of the central bright band, determine the wavelength of light. (4M)
4. a) Describe the construction of Nicol prism and show how it can be used as a polarizer and analyzer. (10M)
   b) At what wavelength, the given quarter wave plate for wavelength 600nm, will act as half wave plate. (4M)
5. a) Classify various lattice types in the cubic crystal system and specify the effective number of lattice points per unit cell in each type. (10M)
   b) Write short notes on Fast breeder Reactors. (4M)
6. a) What is meant by magnetostriction? Explain how ultrasonics are produced in a magnetostriction oscillator. (10M)
   b) Calculate the reverberation time of a hall having its volume 3000 m^3 and the total sound absorption of 80 metric Sabine. Find out the additional sound absorption required for an optimum reverberation. (4M)

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7. a) Write a short note on Ferromagnetic and Ferroelectric materials. (10M)
   b) Discuss intrinsic breakdown in dielectrics. (4M)

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Code No: R161204 **R16** SET - 3

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Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
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3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Express the conditions for bright and dark bands in terms of phase and path difference of two light waves when they interfere. (2M)
   b) Define limit of resolution. (2M)
   c) What is an optical rotation? (2M)
   d) State the Bragg's law. (2M)
   e) What is SONAR? Explain how ultrasonics is used in it. (2M)
   f) Write about non-linear dielectrics. (2M)
   g) Define Bohr magneton. (2M)

PART -B

2. a) Describe the construction and working of Michelson's interferometer. (10M)
   b) In Michelson interferometer when a transparent thin glass plate of refractive index 1.52 is introduced in the path of one of the beams, 100 fringes cross the field of view at a given point. The wave length of light used is $5000A^0$. Find the thickness of the plate. (4M)
3. a) Describe Fresnel theoretical explanation for diffraction phenomenon. Obtain an expression for angular separation in the case of Fraunhofer diffraction at double slit. (10M)
   b) In Fraunhofer diffraction due to a single slit, the screen is placed 2 m away from the slit. If the slit width is 0.2 mm and the first minimum lies 5mm on either side of the central maximum, find the wavelength of incident light. (4M)
4. a) What are Einstein coefficients? Derive the relations between them. (10M)
   b) Can we obtain light amplification in the absence of stimulated emission? Explain. (4M)
5. a) What are Miller indices? How are they obtained? (10M)
   b) Deduce an expression for the interplanar distance in terms of Miller indices for a cubic system. (4M)
6. a) Explain the inverse piezo electric effect. Describe the piezo electric method of producing ultrasonic waves. (10M)
   b) What is ultrasonic testing and explain the basic principle? (4M)
7. a) Explain hysteresis property exhibited by the Ferromagnetic and Ferroelectric materials with a graph. (10M)
   b) What is dielectric loss? Obtain an expression for tangent loss. (4M)
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PART –A

1. a) Show that spacing between two circular rings decreases with increase of order in a Newton's rings experiment. (2M)
   b) What happens to the width of the central maximum in a single slit Fraunhofer diffraction pattern when the slit width is increased? (2M)
   c) Distinguish between ordinary light and laser light. (2M)
   d) What is packing fraction? (2M)
   e) Explain magnetostriction method for producing ultrasonics. (2M)
   f) Differentiate ferroelectrics from dielectrics. (2M)
   g) Why susceptibility of diamagnetic materials is negative? (2M)

PART -B

2. a) What are the coherent sources and discuss various types? Explain their role in the phenomenon of interference. (10M)
   b) When a thin sheet of transparent material of thickness 6.3×10^{-4} cm is introduced in the path of one of the interfering beams, the central fringe shifts to a position occupied by the sixth bright fringe. If λ=5460Å, find the refractive index of the sheet. (4M)

3. a) What is diffraction grating? Explain in detail the Fraunhofer's diffraction due to single slit. (10M)
   b) In a plane transmission grating, the angle of diffraction for the second order principal maximum for the wavelength 5000 Å is 30^0. Calculate the number of lines per cm of the grating. (4M)

4. a) Discuss various methods by which polarized light can be produced. (10M)
   b) What is quarter wave plate? Deduce extreme value of its thickness. (4M)

5. a) Obtain expressions for atomic radius, coordination number and packing fraction for SC, BCC and FCC lattices. (10M)
   b) Determine the number of atoms per unit cell of lead which has an FCC structure. Atomic weight of Pb = 207.2, density of Pb = 11.36×10^3kg/m3 and a= 3.2Å. Also $N_A = 6.023 \times 10^{26}$ /kg mole. (4M)

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6. a) Enumerate the features that an auditorium should have for good acoustics. (10M)
   b) Discuss any two applications of Ultrasonics in detail. (4M)
7. a) Derive a relation between internal field and applied electric field in a dielectric. (10M)
   b) Explain the properties of ferromagnetic materials. (4M)

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