Code No: 07A4BS05 **R07** **Set No. 2**

**II B.Tech II Semester Examinations,December 2010**
**ENGINEERING PHYSICS**
**Bio-Technology**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Find the magnetic dipole moments due to orbital and spin motion of electrons in an atom.
   (b) What are hard and soft magnetic materials? Give their characteristic properties and applications.
   (c) A paramagnetic material has a magnetic field intensity of $10^4$ amp/m. If the susceptibility of the material at room temperature is $3.7 \times 10^{-3}$. Calculate the magnetization and flux density of the material. [6+6+4]
2. (a) What is the difference between polarized and unpolarized light?
   (b) Describe, in detail, the different methods to produce polarized light.
   (c) Describe the construction of a nicol prism. [4+8+4]
3. (a) Explain briefly the basic principle of an optical fiber.
   (b) Describe the structure of different types of optical fibers with ray paths.
   (c) Calculate the fractional index change for a given optical fiber if the respective indices of the core and cladding are 1.563 and 1.498 respectively. [6+6+4]
4. (a) Derive Bragg's law of crystal diffraction.
   (b) Describe, in detail, Debye-Scherrer method for the determination of crystal structure.
   (c) Monochromatic X-rays of wavelength 0.15 nm are incident on a crystal face having an interplanar spacing of 0.16 nm. Find the highest order for which Bragg's reflection maximum can be seen. [4+8+4]
5. (a) What are ultrasonic waves? Describe a method to detect these waves.
   (b) Write notes on
      i. Magnetostriction effect and
      ii. Piezo-electric effect.
   (c) A quartz crystal of thickness 0.001 m is vibrating at resonance. Calculate the fundamental frequency of it. (Youngs modulus of quartz = $7.9 \times 10^{10}$ N/m$^2$ and its density = 2650 kg/m$^3$) [6+6+4]
6. (a) Derive the relation between the probabilities of spontaneous emission and stimulated emission in terms of Einstein's coefficients.

(b) Mention applications of laser in the field scientific research, engineering and medicine. [10+6]

7. (a) Explain the synthesis of carbon Nanotubes.
   (b) Mention and explain about the applications of Nanomaterials. [8+8]

8. (a) Write a short note on Phonons.
   (b) Distinguish between Ferro and Piezoelectric effects.
   (c) What are the advantages of dielectric materials? [4+8+4]

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Code No: 07A4BS05 **R07** **Set No. 4**

**II B.Tech II Semester Examinations,December 2010**
**ENGINEERING PHYSICS**
**Bio-Technology**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Derive an expression for acceptance angle.
   (b) Explain numerical aperature and derive an expression for it.
   (c) The following is the data of an optical fiber, $n_1 = 1.6$, $n_2 = 1.4$, $n_0 = 1.33$. Determine its numerical aperture and acceptance angle. [6+6+4]

2. (a) Explain the following:
      i. Electric flux density (D)
      ii. Electric suspentibility (x)
      iii. Dielectric break down.
   (b) The dielectric constant of He gas at NTP is 1.0000684. Calculate the elctric polarizability of He atoms if the gas contains 2.7×1025 atoms per $m^3$. [8+8]

3. (a) What are the special properties of carbon Nanotubes?
   (b) Discuss about the applications of Nanomaterials. [8+8]

4. (a) Explain the terms
      i. constructive interference and
      ii. destructive interference.
   (b) Derive the condition for the maxima and minima in the Young's experiment.
   (c) A Young's double-slit experiment is performed with a monochromatic source of light having wavelength of 589.0 nm, and a distance of 2.00 m between the slits and the screen. The $10^{th}$ interference minimum is observed at 7.26 mm from the central maximum. Determine the separation between the slits. [5+7+4]

5. (a) Explain in detail the following
      i. Meissner effect and
      ii. penetration depth.
   (b) What are Cooper pairs? How they produce superconductivity in materials?
   (c) Discuss the important applications of superconductors. [4+8+4]

6. (a) Write short note on:
      i. Coherence
      ii. Absorption

iii. Stimulated emission.

(b) With the help of suitable diagrams, explain the principle, construction and working of He-Ne gas laser. [8+8]

7. (a) Write notes on Bragg's law.

(b) Describe Braggs X-ray spectrometer method in the determination crystal structure.

(c) Calculate the glancing angle of (1 1 1) plane of a cubic crystal having axial length 0.19 nm corresponding to the second order diffraction maximum for the X-rays of wavelength 0.058 nm. [4+8+4]

8. (a) Describe an experimental method to determine the sound absorption coefficient of material.

(b) Discuss the factors which are affecting the architectural acoustics and suggest your remedy.

(c) A cinema hall has a volume of 7500 $m^3$. What should be the total absorption in the hall if the reverberation time of 1.5 seconds is to be maintained? [6+6+4]

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Code No: 07A4BS05 **R07** **Set No. 1**

**II B.Tech II Semester Examinations,December 2010**
**ENGINEERING PHYSICS**
**Bio-Technology**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Derive an expression for acceptance angle.
   (b) Write short notes on:
      i. Step index fiber.
      ii. Graded index fiber. [6+10]
2. (a) Discuss the important applications of Nanomaterials in medicine.
   (b) Write a detailed note nanoscience & nanotechnology. [10+6]
3. (a) Give an account of the phenomenon of superconductivity.
   (b) Why a superconductor is termed as a perfect diamagnetic material?
   (c) Write notes on flux quantization. [6+6+4]
4. (a) What are ultrasonic waves? Write their properties.
   (b) What are direct Piezo-electric effect and inverse Piezo-electric effect? Explain their importance and use.
   (c) Discuss the use of ultrasonics for non-destructive testing. [4+6+6]
5. (a) Discuss the merits and demerits of Einstein's quantum theory of specific heat of solids.
   (b) Explain the important requirements of insulators. [8+8]
6. (a) State and derive Brewster's law. Also define plane of vibration and plane of polarization.
   (b) How do you use the phenomenon of double refraction to produce a plane polarized light? Explain in detail.
   (c) At what angle of incidence will the light reflected from water be completely polarized? Does the angle depend on the wavelength of the light? [6+6+4]
7. (a) Explain the importance of Miller indices.
   (b) Derive an expression for the inter-planar spacing in the case of a tetragonal crystal structure.
   (c) Find the number atoms per unit area in (1 1 0) plane of a simple cubic structure. [4+8+4]
8. (a) What is population inversion in laser? How is it achieved?

(b) Distinguish between Homo junction semiconductor laser and Hetero junction semiconductor laser.

(c) Gas has a band energy gap of 1.43eV at 300 k. Determine the wavelength above which an intrinsic photodetector fabricated from this material will cease to operate.

[4+8+4]

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Code No: 07A4BS05 **R07** **Set No. 3**

**II B.Tech II Semester Examinations,December 2010**
**ENGINEERING PHYSICS**
**Bio-Technology**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. (a) Describe different types of polarization.
   (b) Derive Clausius-Mosotti relation. [10+6]

2. (a) Explain the terms:
      i. temporal coherence and
      ii. spatial coherence.
   (b) Explain the formation of Newton's rings and show that the radius of $m^{th}$ dark is proportional to the under root of the wavelength.
   (c) In a Newton's rings experiment, a plano-convex glass (refractive index = 1.52) lens having diameter 10.0 cm is used. When 650.0 nm light is incident normally, 55 bright rings are observed with last one right on the edge of the lens. What is the radius of curvature of the lens? What is the focal length of the lens? [4+8+4]

3. (a) What are ultrasonic waves? Write their properties.
   (b) What is magnetostriction effect? How this effect is employed in the generation of ultrasonics?
   (c) Discuss the use of ultrasonics for non-destructive testing. [4+6+6]

4. (a) Discuss the following:
      i. Direct band gap semiconductors
      ii. Indirect band gap semoconductors.
   (b) Why is population inversion necessary to achieve lasing? [10+6]

5. (a) Explain the critical parameters and their significance in superconductors.
   (b) Write notes on
      i. London penetration depth and
      ii. flux quantization relating to superconductivity.
   (c) The critical temperature of lead is 7.26 K. The initial field at 0 K is $64 \times 10^3$ A/m. Calculate the critical field at 5 K. [4+8+4]

6. (a) Draw the block diagram of fiber optics communication system and explain the function of each element in system.
   (b) Explain the basic principle of Holography. [10+6]

7. (a) Explain the terms
   i. space lattice,
   ii. primitive cell and
   iii. lattice parameters, relating to crystal structure.
   (b) Derive an expression for the interplanar spacing in the case of a cubic structure.
   (c) NaCl crystals have FCC structure. The density of NaCl is 2.18 gm/cm$^2$. Calculate the distance between two adjacent atoms. (Molecular weight of NaCl = 58.5) [4+8+4]

8. (a) Discuss fabrication techniques of Nanomaterials.
   (b) What are the special properties of Carbon Nanotubes? [6+10]

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