

**I B.Tech Regular Examinations, May/Jun 2008**

**ENGINEERING PHYSICS**

**( Common to Civil Engineering, Mechanical Engineering, Chemical Engineering, Mechatronics, Metallurgy & Material Technology, Production Engineering, Aeronautical Engineering and Automobile Engineering)**

**Time: 3 hours**

**Max Marks: 80**

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

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1. (a) Explain the concept of coherence.  
(b) Discuss why two independent sources of light of the same wavelength cannot produce interference fringes.  
(c) What are the necessary conditions for obtaining interference fringes. [4+8+4]
2. (a) Explain the factors like reverberation, reverberation time, loudness and echo are affecting the architectural acoustics.  
(b) How the above mentioned difficulties are overcome. [10+6]
3. (a) What are ferromagnetic domains?  
(b) Discuss Weiss theory of ferromagnetism.  
(c) What are its merits and demerits? [4+8+4]
4. (a) Define packing factor of a unit cell.  
(b) Show that the packing factor for simple cubic, body centered and face centered lattices are 52%, 68% and 74% respectively.  
(c) Iron has BCC structure with atomic weight 55.85 and density 7860 kg/m<sup>3</sup>. Find the lattice constant. [4+8+4]
5. (a) Describe how population inversion is very important in laser.  
(b) Explain the modes of vibrations of CO<sub>2</sub> molecule. Describe the construction and working of CO<sub>2</sub> laser with necessary diagram.  
(c) Distinguish between homojunction and heterojunction semiconductor laser. [4+8+4]
6. (a) What are the points are important to mention single mode fiber?  
(b) Explain with a block diagram, the basic instrumentation technique adopted to explain the communication system.  
(c) A fiber has a core refractive index of 1.44 and cladding refractive index of 1.4. Find its numerical aperture and acceptance angle. [4+8+4]
7. (a) Define thermal capacity.  
(b) Derive the unit of thermal conductivity.

Code No: 07A1BS03

**Set No. 1**

- (c) Derive and discuss one dimensional lattice vibrations in solids. [4+4+8]
8. (a) What is the principle behind the TEM?
- (b) Explain the transmission electron microscopy.
- (c) Give the advantages of TEM. [4+8+4]

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1. (a) Define interference of light.  
(b) Describe and explain the phenomenon of interference of light.  
(c) Two coherent sources whose intensity ratio is 36:1 produce interference fringes. Deduce the ratio of maximum intensity to minimum intensity. [4+8+4]
2. (a) What are ultrasonic waves?  
(b) Write an essay on production, properties and applications of ultrasonics.  
(c) How Ultrasonics are used in non- destructive testing. [4+8+4]
3. (a) Write short notes on flux quantization.  
(b) Discuss the important applications of superconductors  
(c) Calculate the critical current for a wire of lead having a diameter of 1 mm at 4.2 K. Critical temperature for lead is 7.18 K and critical field at 0 K is  $6.5 \times 10^4$  A/m. [4+8+4]
4. (a) Define coordination number and atomic radius.  
(b) Obtain the expressions coordination number and atomic radius for SC, BCC and FCC lattices. [6+10]
5. (a) The first line of principle series of Sodium D - Line at 5890 Å. This corresponds to a transition from the first excited state to the ground state. What is the energy of electron volts of the first excited state?  
(b) Discuss the application of laser in Engineering, Medical and Other fields.  
(c) Explain the pumping methods.
  - i. Optical pumping
  - ii. Electron excitation pumping. [4+8+4]
6. (a) Derive an expression for acceptance angle.  
(b) Derive briefly the different types of fiber with neat diagram.  
(c) Derive the fractional index change. [4+8+4]
7. (a) Derive an expression for internal field in dielectrics.  
(b) Deduce Clausius - Mossotti equations. [10+6]

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**Set No. 2**

8. (a) What is the principle behind the TEM?  
(b) Explain the transmission electron microscopy.  
(c) Give the advantages of TEM. [4+8+4]

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1. (a) What do you mean by polarization?  
(b) How does polarized light differ from ordinary light?  
(c) Explain the mechanism behind the polarization of light. [4+6+6]
2. (a) How does an echo affect an acoustically good hall and mention its remedies.  
(b) Explain the types of noise and how these noises are controlled. [8+8]
3. (a) What is called a Cooper pair?  
(b) How are Cooper pairs formed.  
(c) Mention the importance of a Cooper pair. [4+8+4]
4. (a) Define the packing factor of a unit cell.  
(b) Show that the packing factor for simple cubic, body centered and face centered lattices are 52%, 68% and 74% respectively.  
(c) Iron has BCC structure with atomic weight 55.85 and density 7860 kg/m<sup>3</sup>. Find the lattice constant. [4+8+4]
5. (a) What is meant by LIDAR?  
(b) Give the comparison chart between the lasers Ruby, Nd-Yag, He-Ne, CO<sub>2</sub> and Ga - As.  
(c) A CO<sub>2</sub> laser source emits light at a wavelength of 9.6 μm and has an output power of 10KW. How many photons are emitted in each hour by this laser while operating? [4+8+4]
6. (a) What is meant by attenuation in optical fiber?  
(b) Explain the different types of attenuation. [4+12]
7. (a) What is meant by dielectric loss? What is dielectric breakdown? Write in detail about the various factors contributing to the breakdown in dielectrics.  
(b) The radius of a helium atom is about 0.56 Å. Calculate the polarizability of helium and its relative permeability. The number of helium atoms in a volume of 1 m<sup>3</sup> is  $2.7 \times 10^{25}$  atoms. [4+8+4]
8. (a) Discuss the chemical properties of nano materials.

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**Set No. 3**

(b) Analyze the application of nano technology in the bio fields. [8+8]

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1. (a) What do you mean by polarization?  
(b) How does polarized light differ from ordinary light?  
(c) Explain the mechanism behind the polarization of light. [4+6+6]
  
2. (a) Explain the factors like reverberation, reverberation time, loudness and echo are affecting the architectural acoustics.  
(b) How are the above mentioned difficulties overcome. [10+6]
  
3. (a) What are called magnetic materials?  
(b) Explain the characteristics of Paramagnetic, Diamagnetic and Ferromagnetic substances with examples. [4+12]
  
4. (a) Define the terms coordination number, atomic radius and packing factor.  
(b) Determine the coordination number, atomic radius and packing factor for BCC and FCC lattices. [6+10]
  
5. (a) Write a short note about laser.  
(b) Discuss the various methods involved to get population inversion.  
(c) Explain the following pumping methods.
  - i. Optical pumping
  - ii. Direct electron excitation
  - iii. Inelastic atom-atom collision.
  - iv. Direct electron excitation. [4+8+4]
  
6. (a) What are the advantages between optical fiber communication and ordinary communication?  
(b) Explain the fiber optic communication briefly.  
(c) A silica optical fiber has a core of refractive index of 1.563 and cladding refractive index of 1.498. Determine Acceptance angle, Numerical aperture and critical angle. [4+8+4]
  
7. (a) Discuss two dimensional lattice vibrations in solids.  
(b) Explain the mechanism of thermal conduction.

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**Set No. 4**

- (c) Mention the changes that occur in the heat conduction through metals. [6+6+4]
8. (a) Discuss the chemical properties of nano materials.
- (b) Analyze the application of nano technology in the bio fields. [8+8]

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