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Code: 9ABS102 **1**

B.Tech I Year (R09) Regular & Supplementary Examinations, June 2013

ENGINEERING PHYSICS

(Common to all branches)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Explain the phenomenon of interference.
(b) What are the necessary conditions for obtaining interference fringes?
(c) Give the analytical treatment of interference of light and hence obtain the condition for maximum and minimum intensity.

2 (a) What are Miller indices? What are their important features?
(b) Calculate the ratio $d_{100} : d_{110} : d_{111}$ for simple cubic structure.
(c) Sketch the following planes of the cubic unit cell: (110), (111), and ($\bar{1}$21).

3 (a) Derive time independent Schrodinger wave equation for a free particle.
(b) Explain the physical significance of wave function.

4 Explain the following:
(a) Direct and indirect band gap semiconductors.
(b) P-n junction.
(c) Photo diode.

5 (a) Define the terms magnetic permeability, magnetic induction field strength and magnetization and derive the relation between them.
(b) What are the sources of permanent magnetic moment in magnetic materials?

6 (a) Describe the principle of lasing action.
(b) Mention the important differences between laser beam and ordinary light beam.

7 (a) What is the numerical aperture of an optical fiber and derive an expression for it?
(b) An optical fiber has a core refractive index of 1.55 and cladding refractive index of 1.50. Find its numerical aperture.

8 (a) What are nanomaterials and mention their significance in various fields?
(b) Describe the principal factors causing the change of nanomaterial properties.

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Code: 9ABS102 **2**

B.Tech I Year (R09) Regular & Supplementary Examinations, June 2013

ENGINEERING PHYSICS

(Common to all branches)

Time: 3 hours Max. Marks: 70

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

1 (a) What is meant by double refraction?
(b) Write notes on optic axis and its characteristics.
(c) Discuss the construction and action of Nicol prism.

2 (a) Define coordination number and packing fraction.
(b) Show that FCC is the most closely packed of the three cubic structures by working out the packing factors.
(c) Find the Miller indices of a set of parallel planes which makes intercepts in the ratio 3a:4b on the X and Y-axes and are parallel to Z-axis; a, b, c being primitive vectors of the lattice.

3 (a) State and explain uncertainty principle.
(b) Show that the energies of a particle in a potential box are quantized.

4 (a) Explain law of mass action.
(b) Derive the diode equation.
(c) What are applications of hall effect?

5 (a) Define the terms magnetic susceptibility and relative permeability and derive the relation between them.
(b) Discuss the origin of magnetic moments in magnetic materials.

6 (a) Describe the various construction components of a laser device.
(b) Explain the importance of the concept of energy level diagram in the emission of laser beam.

7 (a) Describe briefly the different types of optical fibers with neat diagrams.
(b) Calculate the refractive indices of core and cladding of an optical fiber with a numerical aperture of 0.33 and their fractional change of refractive indices being 0.02.

8 (a) How the physical and chemical properties of nanomaterials vary with their size?
(b) Write the important applications of nanomaterials.
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Code: 9ABS102 **3**

B.Tech I Year (R09) Regular & Supplementary Examinations, June 2013

ENGINEERING PHYSICS

(Common to all branches)

Time: 3 hours Max. Marks: 70

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

1 (a) What are the necessary conditions for obtaining interference fringes?
(b) What are the types of diffraction and give the differences between them?
(c) Write notes on quarter and half wave plates.

2 (a) What are Miller indices? Draw (001), (120) and ($\bar{2}$11) planes.
(b) How can the inter-planar spacing of a set of Miller planes be calculated in terms of lattice parameters?

3 (a) Explain the de Broglie hypothesis.
(b) Derive time independent Schrodinger wave equation for a free particle.

4 (a) Explain the experiment to determine the hall coefficient.
(b) Explain the applications of hall effect.
(c) The R_H of a specimen is 3.66 x 10^{-4} m^3 c^{-1}. Its resistivity is 8.93 x 10^{-3} Ωm. Find mobility and charge carrier concentration.

5 (a) Explain the terms polarization, polarisability, susceptibility and electric flux density for dielectric.
(b) Derive the relation between dielectric constant and susceptibility of a dielectric.

6 (a) What is penetration depth of a magnetic field on a superconductor and discuss its variation with the temperature?
(b) Describe the significance of penetration depth on superconductor.

7 (a) Explain the advantages and disadvantages of step index optical fiber.
(b) Describe the glass fiber structure.

8 (a) What are nanomaterials? How they are classified?
(b) Describe the basic principles of nanomaterials.

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Code: 9ABS102 **4**

B.Tech I Year (R09) Regular & Supplementary Examinations, June 2013

ENGINEERING PHYSICS

(Common to all branches)

Time: 3 hours Max. Marks: 70

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

1 (a) What are the necessary conditions for obtaining interference fringes?
(b) Discuss the theory of Newton's rings with relevant diagram.
(c) Two coherent sources whose intensity ratio is 36:1 produce interference fringes. Deduce the ratio of maximum intensity to minimum intensity.

2 (a) State Bragg's law of X-ray diffraction.
(b) Describe Bragg's X-ray spectrometer and explain how Bragg's law can be verified.
(c) Draw (001), (120) and ($\bar{2}11$) planes.

3 (a) Explain Bloch theorem.
(b) Discuss the theory of free electron gas in one-dimensional box. Explain the energy levels.

4 (a) Explain law of mass action.
(b) Distinguish between drift and diffusion currents.
(c) Derive expressions for drift and diffusion currents in a semiconductor.

5 (a) Explain electronic polarization in a dielectric.
(b) An elemental dielectric has a relative dielectric constant of 12. It also contains 5×10^{28} atoms/ m^3. Calculate its electronic polarisability assuming Lorentz field.

6 (a) Explain how electron-phonon interaction will form cooper pairs causing superconductivity in superconductor.
(b) Show that the trapped flux in a superconductor is quantized.

7 (a) Describe the construction of a typical optical fiber along with the dimensions of the various parts.
(b) What is total internal reflection? Discuss its importance in optical fiber.

8 (a) Write a detailed note on nanomaterials.
(b) Explain why nanomaterials exhibit different properties.

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