

Subject Code: R13203/R13

Set No - 1

I B. Tech II Semester Supplementary Examinations Feb. - 2015

ENGINEERING PHYSICS

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, Auto E, Min E, Pet E, Metal E)

Time: 3 hours

Max. Marks: 70

Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

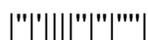
PART-A

- 1.(i) How diffraction is different from interference?
- (ii) Describe the BCC sub lattice and calculate its atomic packing factor.
- (iii) Josephson junction has a voltage of $8.50 \mu\text{V}$ across its terminals. Then calculate the energy and frequency of the generating electro-magnetic waves.
- (iv) What are the conditions to produce total internal reflection in optical fiber?
- (v) Explain the concept of hole.
- (vi) Write notes on Direct and Indirect band gap semiconductors.

[3+4+4+3+4+4]

PART-B

- 2.(a) What is meant by Diffraction of light? Explain it on the basis of Huygen's wave theory.
 - (b) Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
 - (c) Calculate the maximum number of orders possible for a plane diffraction grating
- [5+8+3]
- 3.(a) Define Acceptance angle and derive expression for it.
 - (b) Calculate the Numerical Aperture and Acceptance angle for an optical fiber with core and cladding refractive indices being 1.48 & 1.45 respectively.
 - (c) Explain the importance of optical cavity resonator in a laser.
- [8+4+4]
- 4.(a) What is ferromagnetism? Explain the properties of ferromagnetic materials.
 - (b) Explain the Hysteresis curve in magnetism on the basis of domains.
 - (c) Distinguish between Soft and Hard magnetic materials.
- [6+6+4]
- 5.(a) Explain the terms 'Reverberation' and 'Reverberation time'.
 - (b) Derive Sabine's formula for 'Reverberation time'.
- [4+12]
- 6.(a) Show that for a quantum particle confined to an infinite deep potential box with finite length, the energy levels are quantized.
 - (b) Explain the Fermi-Dirac distribution function of electrons. Explain the effect of temperature on the distribution.
- [10+6]
- 7.(a) State Hall effect.
 - (b) Derive expression for Hall coefficient.
 - (c) The R_H of a specimen is $3.66 \times 10^{-4} \text{ m}^3 \text{ c}^{-1}$. Its resistivity is $8.93 \times 10^{-3} \Omega\text{m}$. Find mobility and charge carrier concentration.
- [4+8+4]



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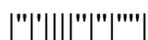
Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

PART-A

- 1.(i) How many orders will be visible, if the wavelength of light is 5000\AA . Given that the number of lines per centimeter on the grating is 6655.
 - (ii) Identify whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason.
 - (iii) The radius of the superconducting ring is 0.02m and its critical magnetic field is $2 \times 10^3 \text{Am}^{-1}$ at 5K. What is value of its critical current?
 - (iv) Distinguish between Spontaneous and Stimulated emissions.
 - (v) What are the necessary conditions of physically acceptable wave function?
 - (vi) Write notes on Direct and Indirect band gap semiconductors.
- [4+4+3+4+3+4]

PART-B

- 2.(a) What are the necessary conditions to get clear and distinct interference fringes?
 - (b) Account for the circular shape of 'Newton's rings' in interference pattern. Obtain an expression for the diameter of the n^{th} dark ring in the case of Newton's rings.
 - (c) In Newton's rings experiment, the diameter of the 5^{th} and 25^{th} rings is 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.
- [4+8+4]
- 3.(a) What are Miller Indices? How are they obtained?
 - (b) Derive expression for interplanar spacing between two adjacent planes of Miller indices (h,k,l) and lattice constant \hat{a} .
 - (c) Explain stimulated emission and why the radiation emitted in this process has more importance than spontaneous emission.
- [4+7+5]
- 4.(a) Explain the origin of different kinds of polarization in dielectrics.
 - (b) Derive an expression for internal field in dielectrics.
- [6+10]
- 5.(a) State and explain Stoke's theorem in its calculus form.
 - (b) Explain in detail the flux quantization in a Superconducting ring.
 - (c) Write notes on Rayleigh's Criterion.
- [6+4+6]
- 6.(a) Derive an expression for the electrical conductivity of a material in terms of mobility of the electron using classical free electron theory.
 - (b) What are the draw backs of classical free electron theory?
 - (c) An electron is confined to a one dimensional potential box of length 2\AA . Calculate the energies corresponding to the second and fourth quantum states in eV.
- [8+4+4]
- 7.(a) Distinguish between n-type and p-type semiconductors.
 - (b) Define Drift & Diffusion currents and derive Einstein's equation.
 - (c) Draw the diagram to show the variation of the Fermi level with temperature and impurity concentration in case of n-type semiconductor.
- [4+8+4]



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Set No - 3

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Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

PART-A

- 1.(i) What is the quarter wave plate? Derive the expression for its thickness.
- (ii) Whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason.
- (iii) Josephson junction has a voltage of $8.50 \mu\text{V}$ across its terminals. Then calculate the energy and frequency of the generating electro-magnetic waves.
- (iv) Distinguish between Spontaneous and Stimulated emissions.
- (v) What are the necessary conditions of physically acceptable wave function?
- (vi) Explain the effect of temperature and impurity on the Fermi level in p-type semiconductor.

[4+4+4+3+3+4]

PART-B

- 2.(a) What is meant by Diffraction of light? Explain it on the basis of Huygen's wave theory.
 - (b) Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
 - (c) Calculate the maximum number of orders possible for a plane diffraction grating
- [5+8+3]
- 3.(a) What are Miller Indices? How are they obtained?
 - (b) Derive expression for interplanar spacing between two adjacent planes of Miller indices (h,k,l) and lattice constant 'a'.
 - (c) Draw the (001) and (120) planes of a cubic cell.
- [4+8+4]
- 4.(a) What do you understand by dielectric constant? Define dielectric susceptibility. Derive the relation between dielectric constant and dielectric susceptibility.
 - (b) Explain electronic polarisability and show that electronic polarisability for a mono atomic gas increases as the size of the atom becomes larger.
- [6+10]
- 5.(a) Explain the terms 'Reverberation' and 'Reverberation time'.
 - (b) Derive Sabine's formula for 'Reverberation time'.
- [4+12]
- 6.(a) Show that for a quantum particle confined to an infinite deep potential box with finite length, the energy levels are quantized.
 - (b) Explain the Fermi-Dirac distribution function of electrons. Explain the effect of temperature on the distribution.
- [10+6]
- 7.(a) State and explain Hall effect.
 - (b) Define Drift & Diffusion currents and derive Einstein's equation.
 - (c) In a Hall coefficient experiment, a current of 0.25A is sent through a metal strip having thickness 0.2mm and width 5mm. The Hall voltage is found to be 0.15mV when a magnetic field of 2000 gauss is used. What is the carrier concentration?
- [4+8+4]



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 Answering the question in **Part-A** is Compulsory,
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PART-A

- 1.(i) What is the quarter wave plate? Derive the expression for its thickness.
 - (ii) Describe the FCC sub lattice and calculate its atomic packing factor.
 - (iii) The radius of the superconducting ring is 0.02m and its critical magnetic field is $2 \times 10^3 \text{ Am}^{-1}$ at 5K. What is value of its critical current?
 - (iv) What are the conditions to produce total internal reflection in optical fiber?
 - (v) Explain the concept of hole.
 - (vi) Explain the electronic transport mechanism for Photo Conductors.
- [4+4+3+3+4+4]

PART-B

- 2.(a) What are the necessary conditions to get clear and distinct interference fringes?
 - (b) Account for the circular shape of 'Newton's rings' in interference pattern. Obtain an expression for the diameter of the n^{th} dark ring in the case of Newton's rings.
 - (c) In Newton's rings experiment, the diameter of the 5^{th} and 25^{th} rings is 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.
- [4+8+4]
- 3.(a) Explain the principle of Optical fiber.
 - (b) Derive expressions for Acceptance angle and Numerical Aperture of an Optical fiber.
 - (c) Explain stimulated emission and why the radiation emitted in this process has more importance than spontaneous emission.
- [3+8+5]
- 4.(a) What is Superconductivity? Discuss the parameters that destruct the Superconductivity.
 - (b) Derive London's equations and also derive the expression for London penetration depth
- [8+8]
- 5.(a) State and explain Stoke's theorem in its calculus form.
 - (b) Explain in detail the flux quantization in a Superconducting ring.
 - (c) Write notes on Rayleigh's Criterion.
- [6+4+6]
- 6.(a) Derive an expression for the electrical conductivity of a material in terms of mobility of the electron using classical free electron theory.
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- [8+4+4]
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 - (b) Define Drift & Diffusion currents and derive Einstein's equation.
 - (c) Draw the diagram to show the variation of the Fermi level with temperature and impurity concentration in case of n-type semiconductor.

[4+8+4]

