Subject Code: R13103/R13 **Set No - 1**

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.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**

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PART-A

1.(i) What are the necessary conditions for obtaining interference fringes?
(ii) Explain the characteristic of laser.
(iii) What are polar and non-polar dielectrics?
(iv) Explain the terms 'Reverberation' and 'Reverberation time'.
(v) Explain the salient features of Classical free electron theory?
(vi) Explain the electronic transport mechanism for Photo Conductors.

[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) Derive expressions for Acceptance angle and Numerical Aperture of an Optical fiber.
(c) Distinguish between soft and hard magnetic materials.

[4+8+4]

3.(a) Explain in detail the principle of Optical fiber.
(b) Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
(c) Find the relaxation time of conduction electrons in a metal of resistivity 1.54×10^{-8} Ω-m, if the metal has 5.8×10^{28} conduction electrons per m^3.

[4+8+4]

4.(a) Derive the relation between the Einstein coefficients.
(b) Derive an expression for the electrical conductivity of a material in terms of mobility of the electron using classical free electron theory.

[8+8]

5.(a) Explain the origin of magnetism in materials.
(b) Derive Sabine's formula for 'Reverberation time'.

[4+12]

6.(a) Derive time dependent Schrodinger wave equation.
(b) Draw and explain B-H curve for a ferromagnetic material placed in a magnetic field.

[8+8]

7.(a) State and explain Hall effect.
(b) Identify whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason.
(c) Write the difference between Spontaneous and Stimulated Emissions.

[6+6+4]

Subject Code: R13103/R13 **Set No - 2**

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.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) What are the necessary conditions for obtaining interference fringes?
(ii) What is meant by Intermodal dispersion in optical fibers? How to overcome this problem? Explain.
(iii) What are polar and non-polar dielectrics?
(iv) What are the fundamental laws of electromagnetism?
(v) Explain the salient features of Classical free electron theory?
(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 the working of Ruby laser with the help of neat energy level diagram.
(c) Draw the crystal planes having Miller indices (110) and (211).

[5+8+3]

3.(a) Explain the origin of energy bands in solids.
(b) Derive expression for interplanar spacing between two adjacent planes of Miller indices (h, k, l) and lattice constant 'a'.
(c) Calculate the maximum number of orders possible for a plane diffraction grating

[6+6+4]

4.(a) Discuss in detail the electronic, ionic and orientational polarizations and their dependence on temperature.
(b) Explain Meissner effect. Describe soft and hard superconductors.

[8+8]

5.(a) Distinguish between conductors, semiconductors and insulators.
(b) Derive Sabine's formula for 'Reverberation time'.

[4+12]

6.(a) Derive expression for Hall coefficient.
(b) Derive an expression for the effective mass of an electron moving in energy bands of a solid. Show how it varies with the wave vector.
(c) Define the terms 'Reverberation' and 'Reverberation time'.

[6+6+4]

7.(a) Write notes on Direct and Indirect band gap semiconductors.
(b) Deduce an expression for Lorentz field relating to a dielectric material.
(c) The R_H of a specimen is $3.66 \times 10^{-4}\ m^3\ c^{-1}$. Its resistivity is $8.93 \times 10^{-3} \Omega m$. Find mobility and charge carrier concentration.

[4+8+4]

Subject Code: R13103/R13 **Set No - 3**

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.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**

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PART-A

1.(i) Distinguish between Interference and Diffraction.
(ii) Explain the characteristic properties of laser.
(iii) The penetration depths for Lead at 3K and 7.1K are 39.6nm and 173nm respectively. Calculate the critical temperature for Lead.
(iv) Explain the terms 'Reverberation' and 'Reverberation time'.
(v) Explain the concept of hole.
(vi) Explain the electronic transport mechanism for Photo Conductors.

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

PART-B

2.(a) Derive expressions for Acceptance angle and Numerical Aperture of an Optical fiber.
(b) State Brewser's law. How can this law be used to produce plane polarized light?
(c) Explain in detail the flux quantization in a Superconducting ring.

[8+4+4]

3.(a) Explain the principle of Optical fiber.
(b) Explain the principle, construction and working of a Nicol prism with neat diagram.
(c) What is meant by Intermodal dispersion in optical fibers? How to overcome this problem? Explain.

[4+8+4]

4.(a) Discuss in detail the electronic, ionic and orientational polarizations and their dependence on temperature.
(b) Derive the expression for condition of maxima and minima for reflected light in case of thin transparent film of uniform thickness.

[8+8]

5.(a) State and explain Stoke's theorem in its calculus form.
(b) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. [Given that μ_e= 1.553 and μ_o= 1.544]
(c) Write a short notes on Rayleigh's Criterion.

[6+4+6]

6.(a) Explain the salient features of Classical free electron theory.
(b) Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
(c) Find the relaxation time of conduction electrons in a metal of resistivity 1.54 x 10^{-8} Ω-m, if the metal has 5.8 x 10^{28} conduction electrons per m^3.

[4+8+4]

7.(a) What do you understand by drift and diffusion currents in the case of a semiconductor? Deduce Einstein's relation relating to these currents.
(b) Derive Eigen values and Eigen functions for a particle in a one dimensional potential box. [8+8]

Subject Code: R13103/R13 **Set No - 4**

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

ENGINEERING PHYSICS

(Common to ECE, EEE, EIE, Bio-Tech, EComE, Agri.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**

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PART-A

1.(i) Calculate the maximum number of orders possible for a plane diffraction grating.
(ii) What is meant by Intermodal dispersion in optical fibers? How to overcome this problem? Explain.
(iii) The penetration depths for Lead at 3K and 7.1K are 39.6nm and 173nm respectively. Calculate the critical temperature for Lead.
(iv) What are the fundamental laws of electromagnetism?
(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) Derive expression for interplanar spacing between two adjacent planes of Miller indices (h, k, l) and lattice constant 'a'.
(b) State Brewser's law. How can this law be used to produce plane polarized light?
(c) Explain in detail the flux quantization in a Superconducting ring.

[8+4+4]

3.(a) Identify whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason.
(b) Derive an expression for wavelength of light in Newton's rings experiment.
(c) Distinguish between soft and hard magnetic materials.

[4+8+4]

4.(a) Explain the origin of magnetism in materials.
(b) Explain the principle, construction and working of a Nicol prism with neat diagram.
(c) Draw the crystal planes having Miller indices (110) and (211).

[4+8+4]

5.(a) State and explain Stoke's theorem in its calculus form.
(b) The R_H of a specimen is 3.66×10^{-4} m^3 c^{-1}. Its resistivity is $8.93 \times 10^{-3} \Omega m$. Find mobility and charge carrier concentration.
(c) Derive an expression for the effective mass of an electron moving in energy bands of a solid. Show how it varies with the wave vector.

[6+4+6]

6.(a) Explain the origin of energy bands in solids.
(b) Write notes on Rayleigh's Criterion.
(c) Derive expression for Hall coefficient.

[6+6+4]

7.(a) State and explain Hall effect.
(b) Draw and explain B-H curve for a ferromagnetic material placed in a magnetic field.
(c) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. [Given that $\mu_e = 1.553$ and $\mu_o = 1.544$]

[6+6+4]