Subject Code: R13203/R13 **Set No - 1**

I B. Tech II Semester Regular/Supply Examinations July/Aug. - 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**

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PART-A

1. (a) If the air film in the Newton's rings apparatus is replaced by an oil film, then how does the radius of the rings change? Explain.
   (b) Distinguish between monochromatic and polychromatic light sources. Give one example for each.
   (c) What is meant by magnetic susceptibility? How is it related to relative permeability? What is the effect of temperature on susceptibility of diamagnetic materials?
   (d) Explain the critical field and critical current in case of super conductor. How are they related?
   (e) What are the conditions to be satisfied by an acceptable wave function?
   (f) How does the Fermi level change with temperature in extrinsic semiconductors? Explain with neat sketch.

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

PART-B

2. (a) What are the necessary conditions to get clear and distinct interference fringes?
   (b) Explain the electronic polarisability and show that electronic polarisability for a monochromatic gas increases as the size of the atoms become larger.
   (c) Mention some applications of Hall Effect.

[4+8+4]

3. (a) What is optical fiber? Explain the principle of Optical fiber.
   (b) Derive expressions for Acceptance angle and Numerical Aperture of an Optical fiber.
   (c) Describe the intrinsic conductivity in an intrinsic semiconductor.

[4+8+4]

4. (a) Explain the terms 'Reverberation' and 'Reverberation time'.
   (b) Derive Sabine's formula for 'Reverberation time'.

[4+12]

5. (a) Differentiate between soft and hard superconductors.
   (b) Derive an expression for the electrical conductivity of a material in terms of mobility of the electron using classical free electron theory.
   (c) Find the relative permeability of a ferromagnetic material if field of strength 220A/m produces a magnetization of 3300A/m in it.

[4+8+4]

6. (a) Define valence band, conduction band and forbidden energy gap in the energy band structure.
   (b) Show that the solution of Schrodinger wave equation for a particle in an infinite potential well leads to the concept of quantization of energy.
   (c) For the metal having $6.5x10^{28}$ conduction electrons per m^3 find the relaxation time of conduction electrons if the metal has resistivity $1.43x10^{-8}\Omega m$.

[4+8+4]

7. (a) State and explain Hall effect.
   (b) Derive expression for Hall coefficient.
   (c) What are the advantages of optical fiber communication system?

[4+6+6]

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Subject Code: R13203/R13 **Set No - 2**

I B. Tech II Semester Regular/Supply Examinations July/Aug. - 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**

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PART-A

1. (a) What happens to the diffraction fringes, if the slit width is reduced in single slit experiment? Explain why?
   (b) If the angle of incidence of a ray is equal to the critical angle at the core – cladding interface of an optical fiber, then in which direction does the ray travel? Explain with neat sketch.
   (c) What are ferromagnetic materials? Why do they exhibit spontaneous magnetization?
   (d) Explain the critical field in case of super conductor. At what temperature the critical field strength required to destroy superconductivity is maximum? Why?
   (e) If 'E' is the ground state energy of the particle confined to move in a 3D potential box, then what would be the increase in energy from second energy level to next higher energy level?
   (f) Distinguish between intrinsic and extrinsic semiconductors.

[3+3+4+4+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) Write notes on Flux quantization.

[4+8+4]

3. (a) Write notes on drift and diffusion currents.
   (b) Explain the formation of Newton's rings and obtain an expression for the diameter of the dark rings in reflected system.
   (c) Derive the expression for maximum number of orders possible for a plane diffraction grating.

[4+8+4]

4. (a) Explain the origin of magnetism in materials.
   (b) Draw and explain B-H curve for a ferromagnetic material placed in a magnetic field.
   (c) Find the numerical aperture and acceptance angle of a fiber of core index 1.4 and fractional index change 0.02.

[4+8+4]

5. (a) How matter waves are different from Electromagnetic waves?
   (b) Explain Hall effect and derive an expression for Hall coefficient. Give any two of its applications.
   (c) Distinguish between soft and hard magnetic materials.

[4+8+4]

6. (a) Explain the salient features of Classical free electron theory.
   (b) Explain the three level and four level laser systems. What are the advantages of four level laser system over three level laser system?
   (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]

7. (a) Explain the terms 'Acceptance angle' and 'Acceptance cone'.
   (b) Based on classical free electron theory, derive an expression for electrical conductivity of metals.
   (c) In Newton's rings experiment, diameter of the tenth dark ring due to wavelength 6000Å in air is 0.5 cm. Find the radius of curvature of the lens.

[4+8+4]

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Subject Code: R13203/R13 **Set No - 3**

I B. Tech II Semester Regular/Supply Examinations July/Aug. - 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**

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PART-A

1. (a) When white light incidents on a diffraction grating, which colored light will be diffracted more? Justify your answer.
   (b) For an optical fiber of fractional index change 0.140, the refractive index of cladding is 1.3. What would be the refractive index of core?
   (c) What are Superconductors? How the energy gap of superconductor varies with temperature?
   (d) Define the term 'magnetic susceptibility, Explain, with the help of graphs, how the magnetic susceptibility varies with temperature in dia, para and ferromagnetic materials.
   (e) Distinguish between matter waves and electromagnetic waves.
   (f) What is the effect of temperature on the electrical conduction properties of conductors, insulators and semiconductors?

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

PART-B

2. (a) Distinguish between Fresnel and Fraunhoffer diffractions.
   (b) Define Drift and Diffusion currents and derive the expressions for drift and diffusion current densities.
   (c) Mention the applications of Josephson's effect.

[4+8+4]

3. (a) What is an optical fiber? Explain the principle of Optical fiber.
   (b) Explain the principle, construction and working of a Nicol prism with neat diagram.
   (c) Explain in detail the flux quantization in a Superconducting ring.

[4+8+4]

4. (a) Explain the important magnetic properties of ferromagnetic materials.
   (b) Give the theory of plane diffraction grating. Obtain the condition for the formation n^{th} order maximum.
   (c) Find the relaxation time of conduction electrons in a metal if its resistivity is $1.54 \times 10^{-8} \Omega m$ and it has 5.8×10^{28} conduction electrons per cubic metre.

[4+8+4]

5. (a) State and explain Stoke's theorem in its calculus form.
   (b) Write notes on Rayleigh's Criterion.
   (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.

[6+6+4]

|''|'''||''||'''||||

6. (a) What are the draw backs of classical free electron theory?
   (b) Explain A.C. and D.C. Josephson's effect with theory.
   (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]

7. (a) Define Packing Fraction and Coordination Number. Obtain the expression for Packing Fractions of BCC and FCC crystals.
   (b) Based on quantum free electron theory, derive an expression for electrical conductivity of metals.

[8+8]

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Subject Code: R13203/R13 **Set No - 4**

I B. Tech II Semester Regular/Supply Examinations July/Aug. - 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**

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PART-A

1. (a) For which ray Canada balsam acts as a rarer medium? Explain why?
   (b) Identify whether unit cells of SC, BCC and FCC lattices are primitive or not. Explain with reason.
   (c) What are super electrons and how are they different from normal electrons? At what temperature the number of super electrons is maximum in a superconductor?
   (d) Explain the terms 'Reverberation' and 'Reverberation time'. On what factors does the Reverberation time depend?
   (e) What is the most probable position for a particle in one dimensional potential box of width 'L' in the first quantum state? Explain graphically.
   (f) Distinguish between n-type and p-type semiconductors.

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

PART-B

2. (a) Derive expressions for Acceptance angle and Numerical Aperture of an Optical fiber.
   (b) State Brewster's law. How can this law be used to produce plane polarized light?
   (c) What are the advantages of optical fiber communication system?

[8+4+4]

3. (a) Distinguish between interference and diffraction.
   (b) Classify the fibers on the basis of refractive index profile, modes and materials.
   (c) Silver has FCC structure and its atomic radius is 1.441Å. Find the spacing of (220) planes.

[4+8+4]

4. (a) Discuss in detail the electronic, ionic and orientational polarizations and their dependence on temperature.
   (b) Derive Eigen values and Eigen functions for a particle in a one dimensional potential box.

[8+8]

5. (a) What are polar and non-polar dielectrics? Give examples for each.
   (b) Based on classical free electron theory, derive an expression for electrical conductivity of metals.
   (c) Newton's rings are formed with sodium light in an experiment. What is the order of the dark ring, which has double the diameter of the fourth dark ring?

[4+8+4]

|''|'''||''||'''||||

6. (a) Explain the salient features of Classical free electron theory.
   (b) Derive the expression for condition of maxima and minima for reflected light in case of thin transparent film of uniform thickness.
   (c) Calculate the thickness of half wave plate of quartz for a wavelength 500nm. Here μ_e= 1.553 and μ_o= 1.544.

[4+8+4]

7. (a) Write a notes on drift and diffusion currents.
   (b) Deduce the expression for Lorentz field relating to a dielectric material.
   (c) Write notes on Flux quantization.

[4+8+4]

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