Code No: R161207 **R16** SET - 1

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1.	a)	Why phase shift occurs when a light ray is reflected from denser medium?	(2M)
	b)	Define resolving power of a microscope.	(2M)
	c)	Explain principle of a Nicol prism.	(2M)
	d)	What are the matter waves?	(2M)
	e)	State the Stoke's theorem.	(2M)
	f)	What is doping process and why it is essential for extrinsic semiconductors?	(2M)
	g)	Compare the ground state energy eigen value of an electron confined in a box of length 1Å to that of a 50 g golf ball confined in a box of length 50 cm.	(2M)

PART –B

2.	a)	Explain why the center of Newton's rings is dark in reflected system. Describe the Newton's rings experiment to determine the radius of curvature of a plano convex lens.	(10M)
	b)	In a Newton's rings experiment, the diameter of 10^{th} dark ring due to a light of wavelength 6000Å in air is 0.5 cm. Find the radius of curvature of the plano convex lens.	(4M)
3.	a)	Explain the principle of formation of multiple spectra with grating and give the characteristics of grating spectra.	(10M)
	b)	How many orders will be visible with the wavelength of incident radiation is 7500Å and the number of lines on the grating is 2500 in one inch.	(4M)
4.	a)	Describe Ruby laser and explain its working with neat energy level diagram.	(10M)
	b)	Write the specific characteristics and their corresponding uses of a laser beam.	(4M)
5.	a)	Write Maxwell's equations in integral form and explain the physical significance of each equation.	(10M)
	b)	What is divergence of a vector field? Explain its physical significance.	(4M)
6.	a)	Discuss any four drawbacks of classical free electron theory. Enumerate salient postulates in quantum free electron theory.	(10M)
	b)	Explain the concept of Fermi energy.	(4M)
7.	a)	Derive an equation for charge carrier concentration of conduction band of an intrinsic semiconductor.	(10M)
	b)	How concepts of drift and diffusion currents are interlinked in a semiconductor?	(4M)

|''|''||''||''||||
~~~~~~

Code No: R161207 **R16** SET - 2

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) What are the coherent sources? (2M)
   b) Write any two differences between interference and diffraction. (2M)
   c) Specify major components of a Laser. (2M)
   d) Write Maxwell's equations. (2M)
   e) Enumerate physical significance of wave function. (2M)
   f) Define drift and diffusion currents in a semiconductor. (2M)
   g) What is an optic axis? (2M)

PART -B

2. a) Explain interference in thin film. Obtain conditions for the formation of dark and bright fringes when thin film is exposed to monochromatic light of wave length (λ). (10M)
   b) A soap film of refractive index 1.33 is illuminated with light of different wavelengths at an angle of 45^0. There is complete destructive interference for $\lambda = 5890$ Å. Find the thickness of the film. (4M)
3. a) Distinguish between single slit and double slit diffraction patterns. Describe qualitatively in detail Fraunhofer diffraction at double slit. (10M)
   b) A Screen is placed 2 m away from a narrow slit. Find the slit width if the first minimum lies 5 mm on either side of the central maximum when plane waves of wave length 500 nm are incident on the slit. (4M)
4. a) What is a double refraction? Describe construction and working of a Nicol's prism and explain how it is used as a polarizer and analyzer. (10M)
   b) A slice of quartz crystal, whose refractive indices are $\mu_o = 1.54$ and $\mu_e = 1.55$, is to be used as a quarter wave plate for light of wavelength 590 nm. Calculate its minimum thickness. (4M)
5. a) Deduce the equation for the propagation of plane electromagnetic waves in the free space. (10M)
   b) What is a field? Discuss vector and scalar fields. (4M)
6. a) Explain the concept of wave particle duality and obtain an expression for the wavelength of matter waves. (10M)
   b) Discuss any four properties of matter waves. (4M)
7. a) Distinguish between semiconductors, conductors, and insulators on the basis of band theory of solids. (10M)
   b) Explain Hall effect with a neat diagram. (4M)
~~~~~~

Code No: R161207 **R16** SET - 3

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019

APPLIED PHYSICS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) Explain the phenomenon of interference. (2M)
   b) What is a grating element? (2M)
   c) Why population inversion is necessary for lasing action? (2M)
   d) What is a field? Explain with some examples. (2M)
   e) Write any two drawbacks of classical free electron theory. (2M)
   f) State the Bloch's theorem. (2M)
   g) Write the conductivity of a semiconductor interms of forbidden energy gap. (2M)

PART -B

2. a) Discuss the construction and working of Michelson's interferometer. How would you measure the wavelength of monochromatic light? (10M)
   b) In a Michelson's interferometer 300 fringes cross the field of view when a movable mirror is displayed through 0.59 mm. Calculate the wavelength of monochromatic light used. (4M)

3. a) What is the limit of resolution? Deduce an expression for it in the case of telescope. (10M)
   b) Elucidate Rayleigh's criterion for resolving power. (4M)

4. a) Discuss the construction and working of He-Ne laser with neat energy level diagram. (10M)
   b) Mention the advantages of He-Ne laser over ruby laser. (4M)

5. a) Write Maxwell's equations in differential form and explain the physical significance of each equation. (10M)
   b) State the Gauss's and Stoke's theorems. (4M)

6. a) Derive an expression for the wave function and energy of a particle confined in a one dimensional potential box using Schrodinger's wave equation. (10M)
   b) An electron is bound in one dimensional infinite well of width 10^{-8} m. Find the energy values of the ground state and first two excited states. (4M)

7. a) What is Hall effect? Explain how Hall voltage is developed in a metal strip when placed in a magnetic field. (10M)
   b) Write a note on effective mass of a hole. (4M)

|''|'''||''||'''||||
~~~~~~

Code No: R161207 **R16** SET - 4

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
APPLIED PHYSICS
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) Explain how interference phenomenon supports the wave nature of light. (2M)
   b) How Fraunhofer diffraction is different from Fresnel diffraction? (2M)
   c) Name some properties, which make laser light different from ordinary light. (2M)
   d) Explain physical significance of divergence of a vector. (2M)
   e) Find the kinetic energy in eV of a neutron with a de-Broglie wave length of 0.30 nm. Given that h = 6.634 x10^{-34} J-s and m=1.67 x 10^{-27} kg. (2M)
   f) What is Fermi factor? (2M)
   g) How can you determine mobility of a charge carrier from Hall effect? (2M)

PART -B

2. a) Explain why Newton's rings are circular. Derive an expression for the radius of the n^{th} dark ring. (10M)
   b) In Newton's rings experiment, the diameters of the 5^{th} and 25^{th} rings are 0.3cm and 0.8cm respectively. If the radius of curvature of the plano-convex lens is 10cm, find the wavelength of the incident light. (4M)
3. a) How diffraction is different from interference? Describe qualitatively in detail Fraunhofer diffraction at a circular aperture. (10M)
   b) In Fraunhofer diffraction pattern due to a circular aperture, the screen is at a distance of 100 cm from the lens. The aperture is illuminated by monochromatic light of wavelength 5893 Å. The diameter of the aperture is 0.1mm. Calculate the separation between the central disc and first secondary minimum. (4M)
4. a) Discuss the methods of production of linearly, circularly and elliptically polarized lights. (10M)
   b) Calculate the thickness of a mica quarter wave plate for a light of wavelength 5460 AU (For mica μ_o = 1.586 and μ_e = 1.592). (4M)
5. a) State and prove Gauss's theorem. (10M)
   b) What is gradient of a scalar field? Explain its physical significance. (4M)
6. a) Obtain Schrodinger's wave equation for a free particle. (10M)
   b) Explain physical significance of wave function. (4M)
7. a) Discuss in detail the Kronig-Penny model of band theory of solids. (10M)
   b) Explain intrinsic and extrinsic semiconductors with examples. (4M)
~~~~~~