Subject Code: R161104/R16 **Set No - 1**

I B. Tech I Semester Regular Examinations Dec. - 2016
APPLIED PHYSICS
(Com. to ECE, CSE, IT, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

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

PART-A

1.	a)	Two independent non-coherent sources of light cannot produce an interference pattern. Why?	(2M)
	b)	State the factors on which the resolving power of grating depends.	(2M)
	c)	Distinguish between polarized light and unpolarized light.	(2M)
	d)	Explain the role of end mirrors in a laser.	(2M)
	e)	What do you understand by the gradient of a scalar field?	(2M)
	f)	Explain matter waves.	(2M)
	g)	What is meant by effective mass of an electron?	(2M)

PART-B

2.	a)	Explain how Newton's rings are formed in the reflected light. Derive an expression for diameter of bright ring.	(6M)
	b)	Explain the basic principle of interferometer	(4M)
	c)	Calculate the thickness of the air film at 10^{th} dark ring in Newton's rings system viewed normally by a reflected light of wavelength 500nm. The diameter of 10^{th} dark ring is 2 mm.	(4M)
3.	a)	Discuss Fraunhofer diffraction due to single slit.	(6M)
	b)	Define Diffraction Grating. What happens when width of the slit is equal to distance between the slits.	(4M)
	c)	A grating of width 2 inches is ruled with 15000 lines per inch. Find the smallest wavelength separation that can be resolved in the second order at a mean wave length of 5000 A^0.	(4M)
4.	a)	Explain the principle, construction and working of a Nicol prism with a neat diagram.	(10M)
	b)	Describe the various methods of pumping mechanisms in lasers.	(4M)
5.	a)	State Gauss theorem and explain its physical significance.	(6M)
	b)	Deduce the equation for the propagation of the plane electromagnetic waves in free space.	(8M)
6.	a)	Derive the Schrodinger time independent wave equation.	(6M)
	b)	Write physical significance of "ψ".	(4M)
	c)	An electron is confined to a one dimensional potential box of length 2 A^0. Calculate the energies correspond to the second and fourth quantum states.	(4M)
7.	a)	Describe the formation of energy bands in crystalline solids.	(4M)
	b)	Derive an expression for density of charge carriers in an extrinsic p-type semiconductor.	(8M)
	c)	Write any two applications of Hall effect.	(2M)

Subject Code: R161104/R16 **Set No - 2**

I B. Tech I Semester Regular Examinations Dec. - 2016
APPLIED PHYSICS
(Com. to ECE, CSE, IT, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

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

*****

PART-A

1.	a)	Mention any two applications of interference.	(2M)
	b)	What happens when the number of rulings in a grating is increased?	(2M)
	c)	What is meant by double refraction?	(2M)
	d)	What do you understand by population inversion?	(2M)
	e)	Define Gauss theorem.	(2M)
	f)	Determine the wave length of an electron accelerated from rest through a potential difference of 100 volts.	(2M)
	g)	Distinguish between extrinsic and intrinsic semiconductors	(2M)

PART-B

2.	a)	Write the necessary theory to determine the radius of curvature of lens using Newton's rings method.	(6M)
	b)	What is interferometer? What is its principle?	(4M)
	c)	In Newton's rings experiment, the diameters of 4^{th} and 12^{th} dark rings are 0.40 cm and 0.70 cm respectively. Find the diameter of 20^{th} dark ring.	(4M)
3.	a)	Derive an expression for the resolving power of the plane diffraction grating.	(6M)
	b)	Explain the difference between interference and diffraction.	(4M)
	c)	A grating has 6000 lines/cm. Find the angular separation between two wavelengths 500 nm and 510 nm in the third order spectrum.	(4M)
4.	a)	With the help of suitable diagrams explain the construction and working of He – Ne gas laser.	(10M)
	b)	What is polarized light? Discuss various methods by which the polarized light can be produced.	(4M)
5.	a)	Define gradient, divergence and curl of a vector. Explain their physical significance.	(6M)
	b)	Discuss the propagation of electromagnetic waves through isotropic dielectric and homogeneous dielectric media.	(8M)
6.	a)	What are matter waves? Obtain an expression for the wavelength of matter waves.	(6M)
	b)	What are the drawbacks of Classical Free electron theory?	(4M)
	c)	An electron is bound in one-dimensional infinite well of width 10^{-10} m. Find the energy values in the ground state and first exited state.	(4M)
7.	a)	Discuss in brief about the behavior of a particle in periodically varying potentials.	(8M)
	b)	Define Hall effect. Obtain an expression for the Hall co-efficient.	(6M)

Subject Code: R161104/R16 **Set No - 3**

I B. Tech I Semester Regular Examinations Dec. - 2016
APPLIED PHYSICS
(Com. to ECE, CSE, IT, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

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

PART-A

1.	a)	What are coherent sources? Give example.	(2M)
	b)	What do you mean by resolving power of an instrument?	(2M)
	c)	Define the working principle of polarimeter.	(2M)
	d)	Write any four applications of Laser.	(2M)
	e)	Define divergence of a vector.	(2M)
	f)	An electron and a proton have the same non-relativistic kinetic energy. Show that the proton has a shorter de Broglie wavelength.	(2M)
	g)	Define drift and diffusion currents.	(2M)

PART-B

2.	a)	With ray diagram discuss the theory of thin films and derive the condition for constructive and destructive interference in the case of reflected system.	(8M)
	b)	Explain why the center of Newton's rings is dark in the reflected system.	(2M)
	c)	Calculate the thickness of a soap film (μ = 1.463) that will result in constructive interference in the reflected light, if the film is illuminated normally with light whose wavelength in free space is 6000 A^0.	(4M)
3.	a)	Discuss Fraunhofer diffraction due to double slit.	(6M)
	b)	Derive an expression for resolving power of an optical instrument.	(4M)
	c)	A parallel beam of sodium light incident on plane transmission grating having 4250 lines per cm and a second order spectral line is observed at an angle of 30^0. Calculate the wavelength of light.	(4M)
4.	a)	Define a quarter wave plate and a half wave plate. Deduce the thickness of a half wave plate for a given wavelength in terms of its refractive indices.	(6M)
	b)	Explain the working of a Ruby laser with energy level diagram.	(8M)
5.	a)	The gradient of a scalar field is a vector. Hence explain how to produce a vector from a scalar field.	(4M)
	b)	State and prove stokes theorem. Give its importance.	(10M)
6.	a)	What are matter waves? Explain their properties.	(4M)
	b)	Discuss the salient features of quantum free electron theory.	(6M)
	c)	Calculate the energy (in eV) required to pump an electron from ground state to the second exited state in a metal of length 10^{-10} m.	(4M)
7.	a)	Explain the classification of crystalline solids based on band theory.	(6M)
	b)	Explain Hall effect and obtain an expression for Hall coefficient and also discuss the effect of increasing amounts of dopants in extrinsic semiconductors.	(8M)

Subject Code: R161104/R16 **Set No - 4**

I B. Tech I Semester Regular Examinations Dec. - 2016
APPLIED PHYSICS
(Com. to ECE, CSE, IT, EIE, E.Com.E.)

Time: 3 hours **Max. Marks: 70**

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

PART-A

1.	a)	Write the conditions for constructive and destructive interference in thin film due to reflected light.	(2M)
	b)	State the condition for diffraction of light to occur.	(2M)
	c)	What are different methods of producing polarized light?	(2M)
	d)	Explain the purpose of active medium in Laser.	(2M)
	e)	Define Stokes theorem.	(2M)
	f)	Compute the de Broglie wavelength of an electron whose kinetic energy is 10 eV.	(2M)
	g)	Define Hall effect.	(2M)

PART-B

2.	a)	Obtain an expression for the diameter of the n^{th} dark ring in the case of Newton's rings.	(6M)
	b)	Explain colors of thin films.	(4M)
	c)	Newton's rings are observed in the reflected light of wavelength 5900 A^0. The diameter of 10^{th} dark ring is 0.5cm. Find the radius of curvature of lens used.	(4M)
3.	a)	Explain with theory the Fraunhofer diffraction at a single slit.	(6M)
	b)	Derive an expression for resolving power of a telescope.	(4M)
	c)	A diffraction grating having 4000 lines per centimeter is illuminated normally by light of wavelength 5000 A^0. Calculate its resolving power in the third order spectrum.	(4M)
4.	a)	Describe the construction of Nicol prism.	(4M)
	b)	Derive the relation between probabilities of absorption, spontaneous emission and stimulated emission in terms of Einstein coefficients.	(10M)
5.	a)	Divergence of a vector field is a scalar. Hence explain how to produce a scalar field from a vector field.	(4M)
	b)	State and prove Gauss theorem. What is divergence of a vector field?	(10M)
6.	a)	Obtain an expression for energy levels of an electron in a one-dimensional potential well of infinite height.	(8M)
	b)	What are the drawbacks of Quantum Free Electron theory?	(2M)
	c)	The minimum energy for a particle entrapped in a one dimensional box is 3.2 x 10^{-18} J. What are next three energies in electron volts the particle can have?	(4M)
7.	a)	Explain i) Effective mass of an electron ii) concept of hole	(8M)
	b)	Define Drift and Diffusion currents and obtain the relation between mobility and Diffusion coefficient.	(6M)