NARSIMHA REDDY ENGINEERING COLLEGE
UGC AUTONOMOUS INSTITUTION
Maisammaguda (V), Kompally - 500100, Secunderabad, Telangana State, India
UGC - Autonomous Institute
Accredited by NBA & NAAC with 'A' Grade
Approved by AICTE
Permanently affiliated to JNTUH

B.TECH FIRST YEAR

QUESTION BANK

Course Title : APPLIED PHYSICS

Course Code : 23PH102/23PH202

Regulation : NR23

Course Objectives:

The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres

Course Outcomes (CO's)

C112.1	**Analyze** the concepts of Quantum mechanics and **Visualize** the difference between conductor, semiconductor, and an insulator by classification of solids.
C112.2	**Identify** the role of semiconductor devices in science and engineering applications.
C112.3	**Explore** the fundamental properties of dielectric and magnetic materials
C112.4	**Appreciate** the features and applications of Nanomaterials.
C112.5	**Analyze** various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT–I

Quantum Physics & Solids

S.No		Questions	BT	CO	PO
		Part – A (Short Answer Questions)			
1		What is photo electric effect. Give the Einstein equation	L1	1	1
2		Give the Born's interpretation of wave function.	L3	1	1
3		State Planck's law with formula	L2	1	1
4		Define a Black body and what black body radiations are.	L2	1	1
5		State Heisenberg uncertainty principle?	L2	1	1
6		What are matter waves? Write some characteristics of matter waves.	LI	1	1
7		Write the significance of quantum mechanics.	L2	1	1
8		State Stefan's law & Wien's displacement law.	L2	1	1
9		Mention a few drawbacks of the classical theory of the free electron.	L2	1	1
10		State Wien's law and Raliegh Jeans formula.	L2	1	1
		Part – B (Long Answer Questions)			
11	a)	Discuss about de-Broglie Hypothesis? Derive an expression for de- Broglie wavelength for an electron.	L2	1	1
	b)	Calculate the wavelength of matter wave associated with a neutron whose kinetic energy is 1.5 times mass of electron.	L2	1	1
12	a)	State and derive Planck's law	L2	1	1
	b)	Hence deduce Rayleigh-jeans law and weins law	L2	1	1,2

13	a)	Derive Schrodinger 1-D wave equation. Discuss Born's interpretation of the wave length.	L3	1	1,2
	b)	Elucidate Black body radiation with energy distribution curves.	L2	1	1
14	a)	Summarize how did DAVISSON-GERMER in their experiment give the experimental verification of matter waves?	L2	1	1
	b)	Find the de-Broglie wavelength associated with electron accelerated to a potential of 6400V	L3	1	1,2
15	a)	Discuss about Photoelectric Effect? What are the factors influencing the photo electric effect?	L2	1	1
	b)	Calculate the work function of sodium if its threshold wavelength is 5040 A^o.	L3	1	1,2
16	a)	Estimate the energy of a particle in 1-D potential box.	L3	1	1,2
	b)	For an electron in a one-dimensional infinite potential well of width $1A^0$, calculate the energy separation between the two lowest energy level and also calculate the frequency and wavelength of phonon corresponding to a transition between these two levels.	L3	1	1,2

UNIT–II

Semiconductors & Devices

S.No		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		What are donors and acceptors? Give two examples each.	LI	2	1
2		What are intrinsic and extrinsic semiconductors?	L2	2	1
3		Draw CE, CB, CC configurations of an n-p-n transistor	LI	2	1
4		Write few applications of solar cell?	LI	2	1
5		State Hall Effect?Write few applications of Hall Effect	L2	2	1
6		What are direct & indirect band gap semi conductors?	L2	2	1
7		State Avalanche & Zener breakdown	L2	2	1
8		Write few applications of LED?	L1	2	1
9		Explain the generation and recombination mechanisms in semiconductors.	L2	2	1
10		Write few applications of PIN diode	L2	2	1
Part – B (Long Answer Questions)					
11	a)	Differentiate between n-type and p-type extrinsic semiconductor	L3	2	1
	b)	Differentiate between intrinsic and extrinsic semiconductors?	L2	2	1
12	a)	State and explain the Hall Effect with its applications?	L2	2	1,2
	b)	A silicon plate of thickness 1mm, breadth 10mm, and length 100mm is placed in a magnetic field of 0.5 wb/m^2 acting perpendicular to its thickness. If 10^{-2} A current flows along its length, calculate the Hall voltage developed if the hall coefficient is $3.66X10^{-4}$ m^3/C	L3	2	1,2
13	a)	Discuss the construction, working, V-I characteristics of P-N junction diode.	L4	2	1
	b)	Discuss the construction, working, V-I characteristics of Zener diode.	L2	2	1
14	a)	Discuss the construction, working, characteristics of a solar cell with neat diagrams	L2	2	1
	b)	Discuss merits, demerits and applications of solar cell	L2	2	1,2

15	a)	What is an LED? Explain the working and characteristics of LED with a neat diagram.	L1	2	1
	b)	Discuss merits, demerits and applications of LED	L3	2	1,2
16	a)	Discuss the construction, working, characteristics of a PIN Diode with neat diagrams	L3	2	1
	b)	Discuss merits, demerits and applications of PIN Diode	L3	2	1,2
17	a)	Discuss the construction, working, characteristics of a Avalanche Photo Diode with neat diagrams	L3	2	1
	b)	Discuss merits, demerits and applications of Avalanche Photo Diode	L3	2	1,2

UNIT–III

Dielectric and Magnetic Materials

S.No		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		What is dielectric constant, electric dipole, dipole moment?	L3	3	1
2		Define magnetic susceptibility, permeability	L1	3	1
3		What are the different types of polarization	L3	3	1
4		What are piezo, pyro, ferro electric material?	L3	3	1
5		Define electric susceptibility and electric permitivity	L3	3	1
6		Derive Clausius mosotti relation.	L3	3	1
7		What is Hysteresis?	L2	3	1
8		What is applications of soft and hard magnetic materials	L2	3	1
9		What is magnetoresistance	L2	3	1
10		What is magnetostriction	L2	3	1
Part – B (Long Answer Questions)					
11	a)	Explain in detail the classification of magnetic materials	L2	3	1
	b)	Describe the Hysteresis behavior of ferromagnetic material.	L3	3	1
12	a)	What are the differences between soft and hard magnetic materials?	L2	3	1
	b)	Derive an expression for Clausius Mosotti relation	L3	3	1
13	a)	Obtain an expression for the internal field seen by an atom in an infinite array of atoms subjected to an external field.	L3	3	1
	b)	Write a note on domain theory of ferromagnetism	L2	3	1,2
14	a)	Discuss different types of polarization and hence derive Langevin – Debye Equation	L2	3	1
	b)	Find the relative permeability of a ferromagnetic material if a field of strength 220amp/meter produces a magnetization 3300amp/meter in it.	L3	3	1,2
15	a)	Differentiate between Dia and Para Magnetic materials	L2	3	1
	b)	Explain the terms: 1. Electric field intensity 2. Polarization vector 3. Displacement vector	L2	3	1

UNIT–IV

Nanotechnology

S.No		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		Define the term nano scale,	L2	4	1
2		Define the term nano technology	L2	4	1
3		Define the term quantum confinement?	L3	4	1
4		What is surface to volume ratio?	L1	4	1
5		What are the applications of nano materials?	L2	4	1
6		How many fabrication techniques are there? Explain?	L2	4	1
7		Write any three top down techniques	L2	4	1
8		Write any three bottom up techniques	L1	4	1
9		Write any three characterization techniques of nanomaterials	L2	4	1
10		What are the few types of nano materials?	L3	4	1,2
Part – B (Long Answer Questions)					
11	a)	Explain any one method in top down approach	L3	4	1
	b)	What are the applications of nanomaterials.	L2	4	1
12	a)	What are the properties of nanomaterials	L2	4	1
	b)	Compare various characterisation techniques.	L3	4	1
13	a)	Explain quantum confinement and surface to volume ratio.	L3	4	1
	b)	Explain Sol-Gel method	L3	4	1
14	a)	Explain ball milling method	L3	4	1
	b)	What is the principle of the XRD method? Mention a few applications of nanomaterials.	L2	4	1,2
15	a)	Discuss about bottom up approach method for fabrication of Nano materials.	L4	4	1
	b)	Explain the working of TEM	L2	4	1
16	a)	Justify the surface to volume ratio of nanomaterials increase its catalytic activity than bulk materials.	L5	4	1,2
	b)	Explain the working of SEM	L2	4	1

UNIT–V

Lasers & Fiber Optics

S.No	Questions	BT	CO	PO
Part – A (Short Answer Questions)				
1	Differentiate between LASER light and conventional light	L1	5	1
2	What is pumping? Write different types of pumping methods?	L2	5	1
3	Write the elements of a laser & define population inversion	L2	5	1
4	Write few applications of laser in industrial field	L2	5	1
5	State stimulated absorption and stimulated emission process?	L1	5	1
6	Define total internal reflection	L1	5	1
7	Differentiate between mono mode and multi mode fiber	L3	5	1

8		Define acceptance angle, and acceptance cone	L2	5	1
9		Define numerical aperture? Write its relation with fractional index change	L3	5	1
10		Why optical fiber communication is beneficial than traditional communication system?	L2	5	1
Part – B (Long Answer Questions)					
11	a)	Write down the characteristics of Laser light.	L2	4	1
	b)	Describe the construction and working of He-Ne laser with suitable diagrams.	L3	4	1
12	a)	Explain the interaction of light radiation with matter and hence deduce Einstein coefficients.	L2	4	1
	b)	Write applications of lasers in scientific and medical fields.	L3	4	1,2
13	a)	Derive an expression for acceptance angle and numerical aperture.	L3	4	1
	b)	Give an account of graded and step index fiber.	L3	4	1
14	a)	Explain with neat diagram the principle and working of a Ruby laser.	L2	4	1
	b)	Write the applications of optical fibers in sensor field.	L3	4	1,2
15	a)	Discuss the losses associated with optical fibers.	L2	4	1
	b)	Write the medical applications of optical fibers.	L3	4	1,2
16	a)	Distinguish between step-index and graded index fibers with the help of refractive index profile.	L2	4	1
	b)	Draw the block diagram of an optical fiber communication sytem and explain the function of each block.	L2	4	1,2

*** Blooms Taxonomy Level (BT)** (L1 – Remembering; L2 – Understanding; L3 – Applying; L4 – Analyzing; L5 – Evaluating; L6 – Creating)

Course Outcomes (CO)

Program Outcomes (PO)

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