INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad-500043

INFORMATION TECHNOLOGY

TUTORIAL QUESTION BANK

Course Title	SEMICONDUCTOR PHYSICS				
Course Code	AHSB13				
Programme	B.Tech				
Semester	II	CSE | IT			
Course Type	Foundation				
Regulation	**IARE - R18**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Chief Coordinator	Mr. A Chandra Prakash, Assistant Professor				
Course Faculty	Ms. S Charvani, Assistant Professor Mr. K Sai Baba, Assistant Professor Mr. T Srikanth, Assistant Professor				

COURSE OBJECTIVES

The course should enable the students to:	
I	Enrich knowledge in principles of quantum mechanics and semiconductors.
II	Develop strong fundamentals of electronic and optoelectronic materials.
III	Enrich knowledge about measuring resistivity, conductivity and other parameters.
IV	Correlate principles and applications of lasers and fiber optics.

COURSE OUTCOMES (COs):

CO 1	Interpret the concept of quantum mechanics with dual nature of matter.
CO 2	Identify different types of semiconductors and dependence of their Fermi level on variousfactors.
CO 3	knowledge about semiconductor physics and discus working and applications of basic devices, including p-n junctions, PIN, Avalanche photodiode, Solar cell
CO 4	Ability to identify appropriate magnetic, and dielectric, materials required for various engineering applications.
CO 5	Understand the working principle of different types of lasers and optical fibre communication.

COURSE LEARNING OUTCOMES (CLO's):

AHSB13.01	Recall the basic principles of physics and apply these concepts of physics in solving the real-time problems.
AHSB13.02	Acquire knowledge about fundamentals in quantum mechanics.
AHSB13.03	Interpretation of dual nature of matter wave concept using Davisson & Germer'sexperiment.
AHSB13.04	Estimate the energy of the particles using Schrödinger's wave equation and apply it to particle in potential box.
AHSB13.05	Understand the band structure of a solid and Classify materials as metals, insulators, or semiconductors, and sketch a schematic band diagram for each one.
AHSB13.06	Recollect the conductivity mechanism involved in semiconductors and calculate carrier concentrations.
AHSB13.07	Acquire knowledge about fundamentals in semiconducting devices
AHSB13.08	Understand the basics of a p-n junction and construction of optoelectronic devices like LED, photo diode. solarcell.
AHSB13.09	Recollect the concept of electric polarization and classify dielectric materials.
AHSB13.10	Recollect the concept of magnetization and classify magnetic materials.
AHSB13.11	Apply different laws of radiation to understand the phenomenon behind production of light.
AHSB13.12	Understand the basic principles involved in the production of Laser light and also real-time applications of lasers.
AHSB13.13	Recollect basic principle, construction, types and attenuation of optical fibers.
AHSB13.14	Understand the importance of optical fibers in real-time communication system.

TUTORIAL QUESTION BANK

MODULE- I				
QUANTUM MECHANICS				
Part - A (Short Answer Questions)				
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	Discuss the de-Broglie's hypothesis of duality of material particles and arrive at the concept of matter waves.	Understand	CO 1	AHSB13.01 AHSB13.03
2	Write an expression for de-Broglie wave length in terms of momentum and kinetic energy.	Understand	CO 1	AHSB13.01 AHSB13.03
3	Light radiation exhibits both particle and wave nature. Explain this conception of light.	Understand	CO 1	AHSB13.01 AHSB13.03
4	Explain the concept of Black body radiation.	Remember	CO 1	AHSB13.01 AHSB13.03
5	Explain the concept of Photoelectric effect.	Remember	CO 1	AHSB13.01 AHSB13.03
6	Explain the concept of Compton effect.	Understand	CO 1	AHSB13.01 AHSB13.03
7	Explain the physical significance of wave function which connects the particle nature and wave nature of matter wave.	Understand	CO 1	AHSB13.01 AHSB13.03
8	Describe behavior of matter waves by giving any two of its properties.	Understand	CO 1	AHSB13.01 AHSB13.03
9	Write expressions for wave function and energy of a particle in three dimensional square well box of infinite potential.	Understand	CO 1	AHSB13.01 AHSB13.03
10	Write expressions for eigen function and eigen values for a particle in one dimensional square well box of infinite potential.	Understand	CO 1	AHSB13.01 AHSB13.03
Part - B (Long Answer Questions)				
1	Explain the concept of Black body radiation	Understand	CO 1	AHSB13.01 AHSB13.03
2	Describe the phenomena of Photoelectric effect with experimental arrangement	Understand	CO 1	AHSB13.01 AHSB13.03
3	What is Compton effect? Explain with neat diagram	Understand	CO 1	AHSB13.01 AHSB13.03
4	Compare a particle with a wave and discuss about dual nature of radiation	Understand	CO 1	AHSB13.01 AHSB13.03
5	Explain Max – Born interpretation (Physical significance) of wave function	Understand	CO 1	AHSB13.01 AHSB13.04
6	Derive an expression for the wavelength associated with electron, accelerated by a potential	Understand	CO 1	AHSB13.01 AHSB13.04
7	Discuss de-Broglie's concept of matter waves	Understand	CO 1	AHSB13.01 AHSB13.03
8	Using Planck's and Einstein's theory of radiation, Show that the wavelength associated with an electron of mass *'m'* and kinetic energy *'E'* is given by $h/\sqrt{2mE}$.	Understand	CO 1	AHSB13.01 AHSB13.03
9	Describe Davisson Germer experiment with a neat diagram and explain how it established the proof for wave nature of electrons.	Understand	CO 1	AHSB13.01 AHSB13.03
10	Considering dual nature of electron, Derive Schrodinger's time independent wave equation for the motion of an electron.	Understand	CO 1	AHSB13.01 AHSB13.04
11	Assuming that a particle of mass m is confined in a field free region between impenetrable walls in infinite height at $x = 0$ and $x = a$, show that the permitted energy levels of a particle are given by $n^2 h^2 / 8 m a^2$.	Understand	CO 1	AHSB13.01 AHSB13.04
12	Discuss the results from the eigen values, eigen functions and probability density for a particle in a one dimensional potential box of infinite height. Also sketch the figures.	Understand	CO 1	AHSB13.01 AHSB13.04

Part - C (Problem Solving and Critical Thinking Questions)				
1	Calculate the velocity and kinetic energy of an electron having wavelength of 0.21nm.	Understand	CO 1	AHSB13.02 AHSB13.03
2	Calculate the de Broglie wavelength associated with a proton moving with a velocity of 1/10 of velocity of light. (mass of proton= 1.674 x 10^{-27} kg).	Understand	CO 1	AHSB13.02 AHSB13.03
3	Calculate the wavelength of an electron raised to a potential 15kV.	Understand	CO 1	AHSB13.02 AHSB13.03
4	Calculate de-Broglie wavelength of neutron. (Given kinetic energy of the neutron is 0.025eV mass of neutron =1.674 x 10^{-27} kg).	Understand	CO 1	AHSB13.02 AHSB13.03
5	Calculate the wavelength of an electron, if the kinetic energy of the electron is 0.025 eV.	Understand	CO 1	AHSB13.02 AHSB13.03
6	Find the wavelength associated with an electron rose to a potential1600V.	Understand	CO 1	AHSB13.02 AHSB13.04
7	Calculate the energies that can be possessed by a particle of mass 8.50 x10^{-31}kg which is placed in an infinite potential box of width 10^{-9}m.	Understand	CO 1	AHSB13.02 AHSB13.04
8	Find the lowest energy of an electron confined in a square box of side 0.1nm.	Understand	CO 1	AHSB13.02 AHSB13.04
MODULE-II				
ELECTRONIC MATERIALS AND SEMICONDUCTORS				
Part – A (Short Answer Questions)				
1	Define Bloch theorem.	Understand	CO 2	AHSB13.05
2	Define a metallic solid and draw its band diagram to explain its electronic behavior.	Understand	CO 2	AHSB13.05
3	On the basis of band theory how the crystalline solids are classified into conductors, semiconductors and insulators.	Understand	CO 2	AHSB13.05
4	Define a semiconductor and draw its band diagram to explain its electronic behavior.	Understand	CO 2	AHSB13.05
5	Define an insulator and draw its band diagram to explain its electronic behavior.	Remember	CO 2	AHSB13.05
6	Write the classification of semiconductors based on variation of conductivity in terms of temperature and doping.	Understand	CO 2	AHSB13.05
7	What do you understand by an intrinsic semiconductor? Give an example.	Remember	CO 2	AHSB13.05
8	Write the expressions for carrier concentration of electrons and holes in intrinsic semiconductors in n-type and p-type semiconductors.	Remember	CO 2	AHSB13.05
9	Write an expression for carrier concentration of electrons in p-type semiconductor.	Understand	CO 2	AHSB13.06 AHSB13.14
10	What is an expression for carrier concentration of holes in n-type semiconductor?	Understand	CO 2	AHSB13.06
11	Give the statement of Hall effect using a proper diagram representing current, magnetic field and Hall voltage.	Understand	CO 2	AHSB13.06
Part - B (Long Answer Questions)				
1	What is Bloch's theorem? Explain in detail the motion of electron in a periodic potential.	Understand	CO 2	AHSB13.05
2	Using Kronig-Penny model show that the energy spectrum of an electron contains a number of allowed energy bands separated by forbidden bands.	Understand	CO 2	AHSB13.05
3	Explain the origin of energy band formation in solids	Understand	CO 2	AHSB13.06
4	Distinguish between intrinsic and extrinsic semiconductors. Indicate on an energy level diagram, the conduction and valence bands, donorand acceptor levels for intrinsic and extrinsic semiconductors.	Understand	CO 2	AHSB13.06
5	Deduce the mathematical expression for intrinsic carrier concentration and hence show that the Fermi level lies at the middle for an intrinsic semiconductor.	Remember	CO 2	AHSB13.05
6	Obtain an expression for carrier concentration of n- type semiconductor.	Understand	CO 2	AHSB13.05
7	Obtain an expression for carrier concentration of p- type semiconductor.	Understand	CO 2	AHSB13.05
8	Explain the dependence of Fermi level on carrier-concentration and temperature in N-type and P-type semiconductor.	Understand	CO 2	AHSB13.06
9	Discuss in detail Hall effect and obtain an expression for Hallcoefficient. Mention the uses of Hall effect.	Understand	CO 2	AHSB13.06
10	Give the graphical representation of Kronig-Penny model. Explain the	Understand	CO 2	AHSB13.06

	conclusions drawn from the graph.			
11	With neat energy band diagrams, explain the classification of materials.	Understand	CO 2	AHSB13.06
12	Derive an expression for the electron concentration in the conduction band of an intrinsic semiconductor.	Understand	CO 2	AHSB13.06
13	Derive an expression for the hole concentration in the valence band of an intrinsic semiconductor.	Understand	CO 2	AHSB13.06
14	What is an intrinsic semiconductor? Explain why an instrinsic semiconductor behaves as an insulator at 0K. Give 2D representations of the crystal of Silicon at T = 0K and T > 0K.	Understand	CO 2	AHSB13.06
15	What is an extrinsic semiconductor? Distinguish between n-type and p-type semiconductors.	Remember	CO 2	AHSB13.05
Part - C (Problem Solving and Critical Thinking Questions)				
1	Find carrier concentration of an intrinsic semiconductor of band gap 0.78eV at 300K. [Given that the effective mass of electron = effective mass of hole = rest mass of electron].	Understand	CO 2	AHSB13.02 AHSB13.06
2	What temperature would the E_F be shifted by 15% from middle of forbidden gap (E_g)? Given E_g =1.2ev, effective mass of holes is 5 times that of electrons.	Understand	CO 2	AHSB13.02 AHSB13.06
3	Calculate intrinsic carrier concentration for Ge at 27^0C. Given Eg in Germanium is 0.7eV.	Understand	CO 2	AHSB13.02 AHSB13.06
4	Calculate Hall voltage developed across the width of the slab of a metallic slab carrying a current of 30A is subjected to a magnetic field of 1.75T. The magnetic field is perpendicular to the plane of the slab and to the current. The thickness of the slab is 0.35cm. The concentration of free electrons in the metalis6.55 x 10^{28}electrons/m^3.	Understand	CO 2	AHSB13.02 AHSB13.06
5	Find carrier concentration, if the hall coefficient of a specimen is 3.66 x $10^{-4}m^3c^{-1}$.	Understand	CO 2	AHSB13.02 AHSB13.06
6	Calculate the density of charge carriers of semiconductor, given the Hall efficient is -6.85 × 10^{-5} m^3/Coulomb.	Understand	CO 2	AHSB13.02 AHSB13.06
MODULE -III				
LIGHT-SEMICONDUCTOR INTERACTION				
Part - A (Short Answer Questions)				
1	Define diffusion and drift with respect to a semiconducting material.	Understand	CO 3	AHSB13.08
2	Explain the terms Carrier generation and recombination.	Understand	CO 3	AHSB13.08
3	Give the differences between Direct and indirect band gaps in semiconducting materials.	Remember	CO 3	AHSB13.08
4	Explain biasing of a semiconductor material. Show how they are connected in forward and reverse biasing.	Understand	CO 3	AHSB13.08
5	Draw the plot of V-I characteristics of a PN junction diode.	Understand	CO 3	AHSB13.08
6	Draw the circuit of a forward biased PN junction diode.	Understand	CO 3	AHSB13.08
7	Define the concept of Photo voltaic effect	Understand	CO 3	AHSB13.08
8	Explain the principle behind LED.	Remember	CO 3	AHSB13.08
9	Draw the circuit of a reverse biased PN junction diode	Remember	CO 3	AHSB13.08
10	Explain the principle behind a photo diode.	Understand	CO 3	AHSB13.08
Part – B (Long Answer Questions)				
1	Explain the terms drift and diffusion. Give the differences between Direct and indirect band gap semiconductors.	Understand	CO 3	AHSB13.08
2	What is forward biasing of a PN junction diode? Draw the circuit diagram and explain.	Understand	CO 3	AHSB13.08
3	Explain the V-I characteristics of a PN junction diode under forward and reverse biasing.	Understand	CO 3	AHSB13.08
4	Discuss about formation of a PN junction diode and explain biasing of the Diode	Understand	CO 3	AHSB13.08
5	What is reverse biasing of a PN junction diode ? Draw the circuit diagram and explain.	Understand	CO 3	AHSB13.08
6	Define the terms generation and recombination relevant to a semiconductor material.	Understand	CO 3	AHSB13.08

7	Discuss the Construction of a Avalanche photo diode with a neat diagram .Explain the working principle of it with the help of band diagram.	Understand	CO 3	AHSB13.08
8	Explain the Construction of a LED with a neat diagram, also discuss the working principle of it with the help of band diagram.	Understand	CO 3	AHSB13.08
9	Describe photo voltaic effect. Explain how a solar cell works in response to incident light.	Understand	CO 3	AHSB13.08
10	Explain the Construction of a photo diode with a neat diagram, and discuss the working principle of it with the help of band diagram.	Remember	CO 3	AHSB13.08
11	Discuss the Construction of a PIN photodiode with a neat diagram, and explain the working principle of it with the help of band diagram.	Remember	CO 3	AHSB13.08
Part – C (Problem Solving and Critical Thinking)				
1	**Calculate** the wavelength of emitted radiation from a	Understand	CO 3	AHSB13.08
2	A semiconductor diode has a wavelength of 1.55μm. Find its band gap in eV.	Remember	CO 3	AHSB13.08
3	**Calculate** the wavelength of emitted radiation from a diode made up of GaAs with a band gap of 1.43eV.	Remember	CO 3	AHSB13.08
4	**Calculate** the wavelength of emitted radiation from a LED made up of GaAs with a band gap of 1.52eV.	Understand	CO 3	AHSB13.08
5	A semiconductor diode laser has a wavelength of 1.65μm. Find its band gap in eV	Understand	CO 3	AHSB13.08
6	Calculate the density of charge carriers of semiconductor, given the Hall coefficient is -7.85×10^{-5} m^3/Coulomb	Understand	CO 3	AHSB13.08
7	Calculate intrinsic carrier concentration for Ge at 37^0C. Given Eg in Germanium is 0.6eV.	Understand	CO 3	AHSB13.08
8	In Silicon Photo diodes for fields above 10^7 Vm^{-1} hole have a saturation velocity of about 10^5 ms^{-1}.Calculate the transit time in a depletion layer of 5μm thick	Understand	CO 3	AHSB13.08
9	The current in a p-n junction at 27ºc is 0.18μA when a large reverse bias voltage is applied calculate the current when a forward bias of 0.98V is applied	Understand	CO 3	AHSB13.08
10	Calculate the diode Capacitance with the following data, $A=1mm^2$; $\varepsilon_r=11.7$; $N_d=10^{21}m^3$; V=10 volts	Understand	CO 3	AHSB13.08
MODULE -IV				
ENGINEERED ELECTRIC AND MAGNETIC MATERIALS				
Part – A (Short Answer Questions)				
1	What do you understand by dielectric constant and electric polarization related to a dielectric material?	Understand	CO 4	AHSB13.09
2	Explain the terms: 1. Displacement vector 2. Electric susceptibility	Remember	CO 4	AHSB13.09
3	Describe polarization vector and polarizability of a dielectric material when placed in external electric field.	Understand	CO 4	AHSB13.09
4	Write notes on electric dipole and electric dipole moment associated with dielectric materials.	Remember	CO 4	AHSB13.09
5	Mention different types of polarizations that occur in dielectric materials in the presence of external electric field.	Understand	CO 4	AHSB13.09
6	When an electric field is applied, how does the phenomenon of polarization takes place?	Understand	CO 4	AHSB13.09
7	Explain the terms: 1. Magnetic fieldintensity 2. Permeability	Understand	CO 4	AHSB13.10
8	Write notes on relative permeability and magnetic moment related to magnetic material.	Remember	CO 4	AHSB13.10
9	Mention the types of magnetic materials based on electron spins.	Understand	CO 4	AHSB13.10
10	Sketch neatly hysteresis loop observed in ferromagnetic materials.	Remember	CO 4	AHSB13.10
Part – B (Long Answer Questions)				
1	On application of external electric field, various polarization processes takes place in dielectric material. **Explain** briefly all these polarization processes.	Understand	CO 4	AHSB13.09

2	**What** is electronic polarization? Derive an expression for electronic polarizability in terms of the radius of the atom.	Understand	CO 4	AHSB13.09
3	**Show** that the ionic polarizability occurring in ionic solids is inversely proportional to square of angular frequency (ω_0).	Understand	CO 4	AHSB13.09
4	Obtain an expression for the internal field experienced by an atom inside a dielectric material subjected to an external field by using Lorentz method.	Understand	CO 4	AHSB13.09
5	Describe the origin of magnetic moment and find the magnetic dipole moments due to orbital and spin motions of an electron.	Understand	CO 4	AHSB13.10
6	How would you differentiate dia, para and ferromagnetic substances based on their magnetic behavior?	Understand	CO 4	AHSB13.10
7	Discuss the magnetization of ferromagnetic material by domain wall movement and rotation of domains based on domain theory of ferromagnetism.	Understand	CO 4	AHSB13.10
8	Draw the hysteresis loop for a ferromagnetic material and explain the loop based on remanent magnetization and coercive field.	Remember	CO 4	AHSB13.10
Part – C (Problem Solving and Critical Thinking)				
1	**Find** the electric susceptibility of a dielectric gas having dielectric constant of 1.000041.	Understand	CO 4	AHSB13.09
2	A parallel capacitor has an area of 100cm^2, a plate separation of 1 cm and is charged to a potential of 100 Volts. **Calculate** the capacitance of the capacitor and the change on the plates.	Understand	CO 4	AHSB13.09
3	The dielectric constant of He gas is 1.0000684. **Find** the electronic Polarizability of He atoms if the gas contains 2.7 x 10^{25} atoms per m^3.	Understand	CO 4	AHSB13.09
4	A solid dielectric with density 3 x 10^{28} atoms / m^3 shows an electronic polarizability of 10^{-40} farad -m^{-2}. Assuming the internal electric field to be a Lorentz field, **calculate** the dielectric constant of the material.	Understand	CO 4	AHSB13.09
5	A parallel capacitor of area 650 mm^2 and a plate separation of 4 mm has a charge of 2x10^{-10} C on it. When a material of dielectric constant 3.5 is introduced between the plates, **what** is the resultant voltage across the capacitors?	Understand	CO 4	AHSB13.09
6	**Calculate** magnetization and magnetic flux density if magnetic field intensity 250amp/m and relative permeability is 15.	Understand	CO 4	AHSB13.10
7	**Find** relative permeability, if H=220amp/m and M=3300 amp/m.	Understand	CO 4	AHSB13.10
8	The magnetic susceptibility of aluminium is 2.3 x 10^{-5}. **Find** its permeability and relative permeability.	Understand	CO 4	AHSB13.10
9	If a magnetic field of strength 300 amp/meter produces a magnetization of 4200 A/m in a ferromagnetic material, **find** the relative permeability of the material.	Understand	CO 4	AHSB13.10
10	A paramagnetic material has a magnetic field intensity of 10^4 A/m. If the susceptibility of the material at room temperature is 3.7 x 10^{-3}, **calculate** the magnetization and magnetic flux density in the material.	Understand	CO 4	AHSB13.10
MODULE -V				
LASERS AND FIBER OPTICS				
Part - A (Short Answer Questions)				
1	Define spontaneous and stimulated emission processes involved during de-excitation of atoms.	Understand	CO 5	AHSB13.11
2	Explain the phenomenon of lasing action required for the production of laser light.	Understand	CO 5	AHSB13.11
3	Explain the different characteristics of laser?	Remember	CO 5	AHSB13.12
4	What are the different types of lasers?	Understand	CO 5	AHSB13.11
5	Mention any three applications of laser beams in different fields.	Understand	CO 5	AHSB13.13
6	Write the expression for Acceptance angle and Numerical aperture of an optical fiber.	Understand	CO 5	AHSB13.13
7	Draw a neat sketch of refractive index profile of step index optical fiber.	Remember	CO 5	AHSB13.14
8	What is the principle behind propagation of light signal through an optical fiber?	Remember	CO 5	AHSB13.14
9	Write the expressions for Snell's law and critical angle associated with an optical fiber.	Understand	CO 5	AHSB13.14
10	Discuss different types of attenuation in optical fibers that occur during	Understand	CO 5	AHSB13.12

	propagation of light signals.			AHSB13.14
Part - B (Long Answer Questions)				
1	What are the characteristics of lasers, and explain the phenomenon of lasing action required for the production of laser light.	Understand	CO 5	AHSB13.14
2	What do you understand by absorption and pumping mechanism related to excitation of atoms from lower to higher energy states?	Understand	CO 5	AHSB13.13
3	Explain the construction of a Ruby laser in detail, with the help of a neat suitable diagram.	Understand	CO 5	AHSB13.13
4	Describe the construction of He-Ne gaseous laser in detail, with the help of a neat diagram.	Understand	CO 5	AHSB13.14
5	Discuss the importance of lasers in various fields like industry, medicine, science, etc., by giving their applications.	Understand	CO 5	AHSB13.14
6	Explain the following terms: i. Spontaneous emission ii. Stimulated emission iii. Pumping mechanism iv.Population inversion	Understand	CO 5	AHSB13.12
7	What is an optical fiber? Explain its construction and principle with a neat diagram.	Understand	CO 5	AHSB13.12
8	Derive an expression for angle of acceptance of an optical fiber in terms of refractive indices of core and cladding	Understand	CO 5	AHSB13.14
9	Define Numerical aperture. Derive an expression for numerical aperture of an optical fiber.	Understand	CO 5	AHSB13.12
10	Explain in detail, different types of optical fibers based on refractive index profile of core medium.	Understand	CO 5	AHSB13.14
11	Draw the block diagram of fiber optic communication system and explain the functions of each block in the system.	Understand	CO 5	AHSB13.14
12	Explain the advantages of optical fibers in communication.	Understand	CO 5	AHSB13.12
13	Explain about different types of attenuations in optical fibers	Understand	CO 5	AHSB13.11
Part – C (Problem Solving and Critical Thinking)				
1	Calculate the wavelength of emitted radiation from a semiconductor diode laser, which has a band gap of 1.44eV.	Understand	CO 5	AHSB13.11 AHSB13.14
2	A semiconductor diode laser has a wavelength of 1.55μm. Find its band gap in eV.	Understand	CO 5	AHSB13.11 AHSB13.14
3	Calculate the wavelength of emitted radiation from a semiconductor diode laser, which has a band gap of 1.68eV.	Understand	CO 5	AHSB13.12 AHSB13.14
4	A semiconductor diode laser has a wavelength of 1.42μm. Find its band gap in eV.	Understand	CO 5	AHSB13.12 AHSB13.14
5	Calculate the refractive indices of core &cladding of an optical fiber with a numerical aperture of 0.33 and their fractional differences of refractive indices being 0.02.	Understand	CO 5	AHSB13.12 AHSB13.14
6	A step index fiber has a numerical aperture of 0.16 and core refractive index of 1.45.Calculate the acceptance angle of the fiber and refractive index of the cladding.	Understand	CO 5	AHSB13.11 AHSB13.14
7	The refractive indices of core and cladding materials of a step index fiber are 1.48 and 1.45 respectively. Calculate i) Numerical aperture ii) Acceptance angle.	Understand	CO 5	AHSB13.11 AHSB13.02
8	An optical fiber has a numerical aperture of 0.02 and a cladding refractive index of 1.59. Find the acceptance angle for the fiber in water which has a refractive index of 1.33.	Understand	CO 5	AHSB13.12 AHSB13.14
9	Calculate the fractional index change for a given optical fiber if the refractive indices of the core and the cladding are 1.563 and 1.498 respectively.	Understand	CO 5	AHSB13.11 AHSB13.14

Prepared By:
Mr. A Chandra Prakash, Assistant Professor

HOD, IT