Meerut Institute of Engineering & Technology, Meerut

CO-Wise AKTU Question Bank

Course: B. Tech **Subject Name: Engg. Physics** **Subject Code: BAS101** **Semester: I/II**

CO No.	Lect. No.	Syllabus Topic (As Per LP)	Ques. No.	Question Statement (As Per AKTU)	Session
CO-1	**1**	Inadequacy of classical mechanics	**1**	Discuss any three physical phenomenon's which could not be explained on the basis of classical Physics.	2022-23
CO-1	**1**	Wien's law & Rayleigh-Jeans law	**2**	State Wien's displacement law and Rayleigh-jeans law? or What is Wien's law?	2020-21 2016-17 2017-18
CO-1	**1**	Planck's theory of black body radiation	**3**	Why is black the best emitter?	2021-22
CO-1	**1**	Planck's theory of black body radiation	**4**	Describe energy distribution in black body radiation?	2016-17 2021-22
CO-1	**1**	Planck's theory of black body radiation	**5**	Write the assumptions of Planck's hypothesis. or Explain Planck's hypothesis about the quantum theory of radiation. or Write down the Planck's expression (formula) for spectral energy density in Black Body radiation.	2018-19 2022-23
CO-1	**2**	Compton Effect	**6**	Explain the modified and unmodified radiations in Compton scattering?	2016-17
CO-1	**2**	Compton Effect	**7**	What is Compton effect & Compton shift? Derive the necessary expression for Compton shift. or What is Compton effect? Derive a suitable expression for Compton shift $\lambda' - \lambda = \frac{h}{m_0 c}(1 - cos\theta)$.	2016-17 2018-19 2020-21 2021-22 2022-23
CO-1	**2**	Compton Effect	**8**	How Compton Effect support the photon nature of light?	2019-20

CO-1	**2**	Compton Effect	**9**	Can Compton effect be observed with visible light? Explain why	2022-23
CO-1	**3**	de-Broglie concept of matter waves	**10**	What are de-Broglie matter waves? or What is the concept of de-Broglie matter waves	2013-14 2017-18
CO-1	**3**	de-Broglie concept of matter waves	**11**	Interpret Bohr's quantization rule on the basis of de-Broglie concept of matter wave	2019-20
CO-1	**3**	de-Broglie concept of matter waves	**12**	What is matter waves associated with a particle generated when only it is in motion?	2020-21
CO-1	**3**	de-Broglie concept of matter waves	**13**	What is the difference between electromagnetic wave and matter wave?	2019-20
CO-1	**3**	de-Broglie concept of matter waves	**14**	Determine the de-Broglie wavelength of photon.	2018-19
CO-1	**3**	de-Broglie concept of matter waves	**15**	Compare the wavelength of a photon and an electron if the two have same momentum.	2012-13
CO-1	**3**	de-Broglie concept of matter waves	**16**	Discuss in brief the dual nature of matter and wave. Deduce an expression for de-Broglie wavelength of helium atom having energy at temperature T K. or What do you mean by wave particle duality?	2019-20
CO- 1	**3**	de-Broglie concept of matter waves	**17**	Show that the phase velocity of de-Broglie wave is greater than the velocity of light.	2007-08
CO-1	**4**	Davisson and Germer Experiment	**18**	Describe the experiment of Davisson and Germer to demonstrate the wave character of electrons. or What was the objective of conducting Davisson and Germer experiment? or What is the aim of Davisson and Germer experiment? Discuss the experiment in detail.	2014-15 2015-16 2022-23 2019-20
CO-1	**5**	Phase velocity and group velocity	**19**	Distinguish between phase velocity and group velocity. Establish a relation between them in a dispersive medium. What will be the relation between these velocities in non- dispersive medium?	2013-14 2014-15 2022-23

CO-1	**5**	Phase velocity and group velocity	**20**	Prove that $v_p \times v_g = c^2$, where v_p = phase velocity and v_g = group velocity	2015-16
CO-1	**6**	Physical interpretation of wave function	**21**	Write the characteristics of wave function.	2015-16
CO-1	**6**	Physical interpretation of wave function	**22**	Show that $\Psi(x,y,z,t) = \Psi(x,y,z)\, e^{-iwt}$ is a function of stationary state	2018-19
CO-1	**6**	Physical interpretation of wave function	**23**	Give physical interpretation of wave function. Also explain Eigen value and Eigen function?	2016-17 2018-19 2021-22 2022-23
CO-1	**6**	Time-dependent Schrodinger wave equations	**24**	Derive time dependent Schrodinger wave equation.	2013-14 2018-19
CO-1	**7**	Time-independent Schrodinger wave equations	**25**	Derive time independent Schrodinger wave equation.	2013-14 2016-17 2020-21 2021-22 2022-23
CO-1	**7**	Particle in a one-dimensional box	**26**	Find an expression for the energy states of a particle in a one – dimensional box. or A particle is in motion along a line X=0 and X=L with zero potential energy. At point for which X<0 and X>L, the potential energy is infinite. Solving Schrodinger equation obtain energy eigen values and Normalized wave function for the particle. or Solve Schrodinger equation for a particle in a one –dimensional box and show that energy eigen values are discrete.	2017-18 2018-19 2019-20 2022-23
CO-1	**7**	Particle in a one-dimensional box	**27**	Show that probability at centre of 1-D potential box is minimum for first excited state.	2019-20
CO-1	**8**	Numerical problems related to Planck's theory	**28**	Calculate the energy of oscillator of frequency 4.2 x 10^{12} Hz at 27^0 C treating it as (a) classical oscillator (b) Planck's oscillator.	2018-19
CO-1	**8**	Numerical problems related to Compton effect	**29**	X-rays of Wavelength 2 Å are Scattered from a black body and x-rays are scattered at an angle of 45°. Calculate Compton shift, wavelength of scattered photon λ'.	2018-19

CO-1	**8**	Numerical problems related to Compton effect	**30**	The wavelength of an X-ray photon is doubled on being scattered through 90° with a carbon block in a Compton Experiment. Find out the wavelength of the incident photon. (Electron mass m_e = 9.1 × 10^{-31} kg, Planck's constant h = 6.63 × 10^{-34} m^2kg/s, speed of light c = 3.0 ×10^8 m/s).	2022-23
	9	Numerical problems related to de-Broglie matter wave	**31**	Calculate the wavelength of an electron that has been accelerated in a particle accelerator through a potential difference of 100 volts.	2013-14
CO-1	**9**	Numerical problems related to de-Broglie matter wave	**32**	Calculate the de-Broglie wavelength of a proton moving with a velocity equal to one-twentieth of the velocity of light.	2012-13
CO-1	**9**	Numerical problems related to de-Broglie matter wave	**33**	Calculate the de-Broglie wavelength of a neutron having kinetic energy of 1eV. (Mass of the neutron = 1.67×10^{-27} kg, h= 6.62×10^{-34} joule sec)	
CO-1	**9**	Numerical problems related to particle in one dimensional box	**34**	Determine the probability of finding a particle trapped in a box of length L in the region from 0.45L to 0.55L for the ground state.	2017-18
CO-1	**9**	Numerical problems related to particle in one dimensional box	**35**	A particle confined to move along X-axis has the wave function Ψ= ax between x=0 and x= 1 and Ψ= 0 elsewhere. Determine the probability of finding a particle between x= 0.35 to x= 0.45.	2013-14
CO-1	**9**	Numerical problems related to particle in one dimensional box	**36**	Find the two lowest permissible energy states for an electron which is confined in one dimensional infinite potential box of width 3.5 x 10^{-9} m. or An electron is trapped in a box of length 1.0 Å. Find the amount of energy that must be supplied to excite the electron from ground to first excited state. or Calculate the energy difference between the ground state and the first excited state for an electron in a one dimensional rigid box of length 2.5 Å.	2014-15 2020-21 2021-22 2022-23
CO-2	**10**	Basic concept of Stoke's theorem and Divergence theorem	**37**	State and explain Stoke's theorem and Divergence theorem.	2022-23
CO-2	**11**	Continuity equation for current density	**38**	Derive a suitable expression for continuity equation. Give its physical significance. or What is the equation of continuity? Obtain the required expression for it. Also give its physical significance. or Write down the expression for Continuity Equation in differential form.	2016-17 2018-19 2022-23

CO-2	**11**	Displacement current	**39**	What is displacement current? or What is the difference between conduction current and displacement current?	2014-15 2015-16 2016-17 2017-18 2018-19 2020-21 2022-23
CO-2	**11**	Displacement current	**40**	Explain the concept of displacement current and show how it leads to modification of Ampere law. or Why Maxwell proposed that Ampere law require modification?	2016-17 2018-19 2019-20
CO-2	**12**	Maxwell's Equations in differential & integral form	**41**	Derive Maxwell's equations in differential form. Give physical significance of each equation. or Write Maxwell's equations in integral and differential form and explain their physical significance with their derivation.	2017-18 2018-19
CO-2	**12**	Maxwell's Equations in differential & integral form	**42**	Deduce Coulomb's law of electrostatics from Maxwell's first equation.	2018-19
CO-2	**12**	Maxwell's Equations in differential & integral form	**43**	Show that magnetic monopoles do not exist.	2020-21
CO-2	**13**	Maxwell's equations in vacuum and conducting medium	**44**	Deduce four Maxwell's equations in free space.	2019-20 2020-21
CO-2	**14**	Poynting vector and Poynting theorem	**45**	What is Poynting theorem? Or State and deduce Poynting theorem for the flow of energy in an electromagnetic field. or Discuss the work-energy theorem for the flow of energy in an electromagnetic field.	2016-17 2018-19 2019-20 2020-21 2022-23
CO-2	**14**	Poynting vector and Poynting theorem	**46**	Discuss the physical significance of Poynting theorem.	2020-21 2016-17

CO-2	**14**	Poynting vector and Poynting theorem	**47**	What is Poynting vector?	2013-14 2016-17 2018-19
CO-2	**15**	Plane electromagnetic wave in vacuum &transverse nature	**48**	Derive the electromagnetic wave equations in free space. Prove that the electromagnetic waves propagate with speed of light in free space. or Derive the equation for the propagation of plane electromagnetic wave in free space. Show that the velocity of plane electromagnetic wave in free space is given by c $=1/\sqrt{\mu_0\epsilon_0}$.	2015-16 2017-18 2018-19 2020-21 2021-22, 2022-23
CO-2	**15**	Plane electromagnetic wave in vacuum &transverse nature	**49**	Prove that electromagnetic waves are transverse in nature. or Show that electric and magnetic vectors are normal to the direction of propagation of electromagnetic wave. or Show that E, H and direction of propagation form a set of orthogonal vectors.	2016-17 2017-18 2018-19 2020-21 2021-22 2022-23
CO-2	**15**	Plane electromagnetic wave in vacuum &transverse nature	**50**	What do you mean by impedance of a wave?	2019-20
CO-2	**16**	Skin depth	**51**	What do you mean by depth of penetration or skin depth?	2016-17 2018-19 2022-23
CO-2	**16**	Skin depth	**52**	Define the concept of skin depth for high and low frequency waveforms.	2021-22
CO-2	**17**	Numerical problems related to Maxwell's equation	**53**	For a conducting medium, $\sigma = 5.8 \times 10^6$ Siemens/m and $\boldsymbol{\varepsilon_r = 1}$. Find out the conduction and displacement current densities if the magnitude of electric field intensity E is given by E=150 sin (10^{10} t)Volt/m.	2018-19 2020-21
CO-2	**17**	Numerical problems related to Poynting vector	**54**	Calculate the magnitude of Poynting vector at the surface of the Sun. Given that power radiated by Sun is 5.4×10^{28} W and its radius is 7×10^8 m.	2014-15 2018-19
CO-2	**17**	Numerical problems related to Poynting vector	**55**	If the magnitude of H in a plane wave is 1 amp/meter, find the magnitude of E for plane wave in free space.	2015-16
CO-2	**17**	Numerical problems related to Poynting vector	**56**	In an electromagnetic wave, the electric and magnetic fields are 100 V/m and 0.265 A/m. What is maximum energy flow?	2021-22

CO-2	**17**	Numerical problems related to Poynting vector	**57**	A 100-watt sodium lamp radiating its power. Calculate the electric field and magnetic field strength at a distance of 5 m from the lamp.	2015-16 2018-19 2022-23
CO-2	**17**	Numerical problems related to Poynting vector	**58**	Assuming that all the energy from a 1000 watt lamp is radiated Uniformly. Calculate the average values of the intensities of electric and Magnetic fields of radiation at a distance of 2 m from the lamp.	2021-22
CO-2	**17**	Numerical problems related to Poynting vector	**59**	The sunlight strikes the upper atmosphere of earth with energy flux $1.38 kWm^{-2}$. What will be the peak values of electric and magnetic field at the points?	2019-20
CO-2	**17**	Numerical problems related to Poynting vector	**60**	If the earth receives 2 $cal/(min\text{-}cm^2)$ solar energy, what are the amplitudes of electric and magnetic fields of radiation?	2009-10
CO-2	**17**	Numerical problems related to skin depth	**61**	For silver, $\mu = \mu_o$ and $\sigma = 3x\ 10^7$ mhos/m. Calculate the skin depth at 10^8 Hz frequency. [Given, $\mu_o = 4\pi\ x10^{-7}\ N/A^2$]	2016-17 2022-23
CO-3	**18**	Introduction about Interference	**62**	Write the main condition for sustained interference.	2015-16
CO-3	**18**	Introduction about Interference	**63**	What happens when Young double slit experiment immersed in water.	2015-16
CO-3	**18**	Coherent sources	**64**	Two independent sources cannot produce interference. Why? or What are coherent sources	2015-16 2018-19 2020-21 2013-14 2022-23
CO-3	**18**	Interference in uniform thin films	**65**	Discuss the phenomenon of interference in thin film due to reflected light. or Discuss the phenomenon of interference of light due to thin films and find the conditions of maxima and minima. Show that reflected and transmitted systems are complementary in thin films. or Describe the phenomenon of interference in thin film (uniform thickness) due to reflected light and write down the conditions for constructive and destructive interference.	2015-16 2018-19 2022-23
CO-3	**19**	Wedge shaped films	**66**	Discuss the formation of interference fringes due to a wedge shaped film seen by normally reflected monochromatic light and derive an expression for fringe width in wedge shaped films.	2015-16 2017-18 2022-23

CO-3	**19**	Wedge shaped films	**67**	Explain the factor responsible for changing fringe width in wedge shaped thin film. or What are the changes that are used in diffraction pattern if the numbers of slits are made large?	2016-17 2022-23
CO-3	**19**	Necessity of extended sources	**68**	Explain the necessity of extended sources.	2018-19
CO-3	**20**	Newton's rings and its application	**69**	Why the centre of Newton's ring is dark in reflected system?	2015-16
CO-3	**20**	Newton's rings and its application	**70**	Explain briefly Why Newton's rings are circular?	2019-20
CO-3	**20**	Newton's rings and its application	**71**	What do you understand by Newton's ring? Explain their experimental arrangement. How can you determine the wavelength of light with this experiment?	2015-16 2016-17 2018-19
CO-3	**20**	Newton's rings and its application	**72**	Show that diameter for bright rings are proportional to square root of odd natural number and for dark ring, diameters are proportional to square root of natural number.	2014-15 2018-19 2019-20
CO-3	**20**	Newton's rings and its application	**73**	Describe how Newton's ring experiment can be used to determine the refractive index of a liquid.	2022-23
CO-3	**20**	Newton's rings and its application	**74**	What happen to diameter of Newton's ring, if a liquid of refractive index μ is inserted between plano-convex lens and plane glass plate?	2019-20
CO-3	**20**	Numerical problems related to thin film	**75**	Calculate the thickness of soap bubble thin film that will result in constructive interference in reflected light. The film is illuminated with light of wavelength 5000Å and refractive index of film is 1.45.	2020-21
CO-3	**21**	Numerical problems related to thin film	**76**	Two plane glass surfaces in contact along one edge are separated at the opposite edge by a thin wire. If 25 interference fringes are observed between these edges in sodium light of wavelength 5898 A^0 of normal incidence, then find the thickness of the wire.	2015-16
CO-3	**21**	Numerical problems related to thin film	**77**	A soap film of refractive index 1.43 is illuminated by white light incident at an angle of 30°. The reflected light is observed with a spectroscope in which dark bands corresponding to wavelength 6×10^{-7} m is observed. Calculate the thickness of the film.	2019-20
CO-3	**21**	Numerical problems related to thin film	**78**	White light is incident on a soap film at an angle $\sin^{-1}(4/5)$ and the reflected light is observed with a spectroscope. It is found that two consecutive dark bands corresponding to wavelength 6.1×10^{-5} and 6×10^{-5}m. If the refractive index for soap solution is 4/3. Calculate the thickness of the film.	2019-20

CO-3	**21**	Numerical problems related to wedge shaped film	**79**	Light of wavelength 6000 Å falls normally on a thin wedge shaped film of refractive index 1.4 forming the fringes that are 2 mm apart. Find the angle of wedge.	2018-19,
CO-3	**21**	Numerical problems related to Newton's Ring	**80**	If in a Newton's ring experiment, the air in the inter space is replaced by a liquid of refractive index 1.33 in what proportion would the diameter of the rings changed?	2015-16
CO-3	**21**	Numerical problems related to Newton's Ring	**81**	A light source of wavelength 6000 Å is used along with Plano-convex lens with radius of curvature equal to 100cm in a Newton's ring arrangement. Findout the diameter of the 15^{th} dark ring.	2022-23
CO-3	**21**	Numerical problems related to Newton's Ring	**82**	In Newton's ring experiment the diameter of 4th and 12th dark ring are 0.4 cm and 0.7 cm respectively. Deduce the diameter of 20th dark ring.	2015-16
CO-3	**21**	Numerical problems related to Newton's Ring	**83**	A parallel beam of light of wavelength 5890 Å falls normally on a film of oil (refractive index = 1.46). If the 8^{th} dark ring be seen, when viewed at an angle of 30° to the normal, Calculate the thickness of the film.	2013-14
CO-3	**22**	Introduction to diffraction,	**84**	Distinguish between Fraunhoffer and Fresnel diffraction. or What do you understand by the phenomenon of Fraunhoffer diffraction?	2019-20 2021-22 2022-23
CO-3	**22**	Fraunhoffer diffraction at single slit	**85**	Obtain intensity expression for single slit Fraunhoffer diffraction pattern. or Discuss the phenomena of Fraunhofer's diffraction at a slit and show that relative intensities of the successive maximas are nearly **1 : ($4/9\pi^2$) : ($4/25\pi^2$) : . . . . .** **or** Obtain an expression for the intensity distribution due to Fraunhoffer diffraction at a single slit. or Discuss the phenomenon of Fraunhoffer diffraction at a single slit. Show that the intensity of the first subsidiary maximum is about 4.5% of the principal maximum. or Find out the ratio of intensities of successive secondary maxima compared to the intensity of the principle maximum.	2014-15 2015-16 2017-18 2018-19 2018-19 2019-20 2022-23
CO-3	**22**	Fraunhoffer diffraction at single slit	**86**	Find the expression for the width of central maxima.	2012-13
CO-3	**22**	Fraunhoffer diffraction at single slit	**87**	What happen to diffraction pattern when slit width of single slit experiment increases?	2016-17

CO-3	**23**	Fraunhoffer diffraction at double slit	**88**	How the diffraction pattern modified when single slit is replaced by double slit? or What will be the effect on the intensity of principle maxima of diffraction pattern when single slit is replaced by double slit?	2014-15 2015-16
CO-3	**24**	Diffraction grating	**89**	Give the construction and theory of plane transmission grating? or What is diffraction grating? Discuss the phenomena of diffraction due to plane diffraction grating.	2015-16 2017-18
CO-3	**24**	Absent spectra	**90**	What do you understand by missing order spectrum? What particular spectra would be absent if the width of transparencies twice of opacities of grating?	2015-16 2016-17 2018-19 2022-23
CO-3	**24**	Absent spectra	**91**	Show that only first order is possible if the width of grating element is more than wavelength of light and less than twice the wavelength of light.	2012-13
CO-3	**25**	Spectra with grating	**92**	Explain the formation of spectra by diffraction grating.	2018-19 2020-21
CO-3	**25**	Resolving power of grating	**93**	What do you mean by resolving power on an optical instrument? or What do you mean by resolving power of grating?? Derive the necessary expression. What is resolving power of grating? or Discuss the resolving power of plane transmission grating and find the relation between resolving and dispersive power of the grating.	2013-14 2015-16 2018-19 2019-20 2022-23
CO-3	**25**	Resolving power of grating	**94**	How one can increase the resolving power of a diffraction grating? Using Rayleigh criterion of resolution for just resolution, Show that the resolving power of grating is equal to nN, where n is order of spectrum and N is total number of lines on the grating.	2021-22
CO-3	**25**	Dispersive power of grating	**95**	Define dispersive power of a plane transmission diffraction grating.	2017-18 2018-19 2019-20 2013-14

CO-3	**26**	Rayleigh criterion of resolution	**96**	What is a Rayleigh criterion of resolution?	2013-14 2015-16 2016-17 2020-21 2022-23
CO-3	**26**	Rayleigh criterion of resolution	**97**	Show the intensity ratio of mass $\frac{I_{min}}{I_{max}}$ for resolution limit.	2015-16
CO-3	**27**	Numerical problems related to single slit	**98**	Light of wavelength 5500 Å falls normally on slit of width 22.0 $\times10^{-5}$ cm. Calculate the angular position of two minima on either side of central maxima.	2015-16
CO-3	**27**	Numerical problems related to single slit	**99**	A light of wavelength 6000Å falls normally on a slit of width 0.10 mm. Calculate the total angular width of the central maximum.	2017-18 2022-23
CO-3	**27**	Numerical problems related to single slit	**100**	Newton's rings are observed in reflected light of wavelength 5900 Å. The diameter of 10^{th} dark ring is 0.50cm. Find the radius of curvature of the lens.	2021-22
CO-3	**27**	Numerical problems related to single slit	**101**	Calculate the angle at which the first dark band and the next bright band are formed in the Fraunhoffer diffraction pattern of a slit 0.3 mm wide (Wavelength = 5890 Å)	2019-20
CO-3	**27**	Numerical problems related to grating	**102**	A diffraction grating used at normal incidence gives a yellow line (λ = 6000Å) in a certain spectral order superimposed on a blue line (λ = 4800Å) of next higher order. If the angle of diffraction is sin-1(3/4), calculate the grating element.	2015-16
CO-3	**27**	Numerical problems related to grating	**103**	A diffraction grating used at normal incidence gives a green line (λ = 5450Å) in a certain spectral order superimposed on a violet line (λ = 4100Å) of next higher order. If the angle of diffraction is 30°, then how many lines per cm are there in grating?	2015-16
CO-3	**27**	Numerical problems related to grating	**104**	Find the angular separation of 5048 Å and 5016 Å wavelength in second order spectrum obtained by a plane diffraction grating having 15000 lines per inch.	2018-19
CO-3	**27**	Numerical problems related to grating	**105**	In a grating spectrum, which spectral line in 4^{th} order will overlap with 3^{rd} order line of 5461Å?	2013-14 2018-19
CO-3	**27**	Numerical problems related to resolving power	**106**	A plain transmission grating has 15000 lines per inch. Find the resolving power of grating and the smallest wavelength difference that can be resolved with a light of 6000Å in the second order.	2016-17

CO-3	**27**	Numerical problems related to resolving power	**107**	A plane transmission grating has 16,000 lines to an inch over a length of 5 inches. Find in the wavelength region of 6000 Å, in the second order (i) the resolving power of grating and (ii) the small wavelength difference that can be resolved.	2019-20, 2022-23
CO-4	**28**	Principle and construction of optical fibre	**108**	What is the principle of operation of an optical fibre?	2018-19
CO-4	**28**	Principle and construction of optical fibre	**109**	With the help of well labeled diagram, name the components of an optical fiber. or Discuss the structure of an optical fibre.	2015-16 2020-21
CO-4	**28**	Classification of Fibre	**110**	What do you understand by an optical fibre and discuss its classifications. or What are various types of optical fibres? Explain their advantages and disadvantages.	2015-16 2018-19
CO-4	**28**	Classification of Fibre	**111**	Why model dispersion is negligible in single mode fiber?	2019-20
CO-4	**28**	Classification of Fibre	**112**	What do you understand by the mode of an optical fibre? Discuss the merits and demerit of single (mono) mode fibre over multimode counterpart. or State any two differences between single mode and multi-mode step index fiber.	2018-19, 2022-23
CO-4	**29**	V Number	**113**	What is the condition for number of modes in single and multimode optical fibre?	2015-16
CO-4	**30**	Acceptance angle, Numerical aperture, Acceptance cone	**114**	What do you mean by acceptance angle& acceptance cone. or What do you mean by critical angle, acceptance angle, acceptance cone and numerical aperture? Derive expression for them. or Define the relative refractive index difference of an optical fibre. Show how it is related to numerical aperture. or Find out the expressions for acceptance angle and numerical aperture of an optical fiber in terms of the refractive index of core and cladding.	2014-15, 2015-16, 2022-23
CO-4	**31**	Attenuation in fibre	**115**	What do you understand by attenuation in an optical fiber?	2015-16 2020-21 2022-23

CO-4	**31**	Dispersion in fibre	**116**	Discuss the different type of pulse dispersion in optical fibre. or What do you understand by dispersion in an optical fiber?	2013-14 2017-18
CO-4	**31**	Dispersion in fibre	**117**	What precautions are needed to minimize material dispersion?	2016-17
CO-4	**31**	Losses in fibre	**118**	What do you mean by scattering losses in fibre or Discuss the important factors responsible for the loss of power in optical fibre.	2013-14 2022-23
CO-4	**31**	Application of fibre.	**119**	Describe briefly any three applications of optical fibre.	2022-23
CO-4	**32**	Numerical problems related to acceptance angle, numerical aperture & critical angle	**120**	If refractive index of core and cladding of an optical fibre are 1.50 and 1.45 respectively determine the values of numerical aperture, acceptance angle and critical angle of the fibre.	2014-15
CO-4	**32**	Numerical problems related to V number	**121**	A step index fibre has core refractive index 1.468, cladding refractive index 1.462. Compute the maximum radius allowed for a fibre, if it supported only one mode at a wavelength 1300 nm.	2015-16
CO-4	**32**	Numerical problems related to V number	**122**	A step index fibre has μ_1= 1.466 and μ_2= 1.46, where μ_1 and $\mu_2$are refractive indices of core and cladding respectively. If the operative wavelength of the rays is 0.85 μm and the diameter of the core = 50 μm. Calculate the cut-off parameter and number of modes which the fibre will support.	2021-22
CO-4	**32**	Numerical problems related to attenuation	**123**	A communication system uses a 25 km long fiber having a loss of 2.5dB/km. The input power is 2500μW, Compute the output power. or Calculate the loss through the optical fibre when the mean optical power launched into a 5 km length of fibre is 120×10^{-6} W and the mean optical power at receiver is 4×10^{-6} W.	2017-18 2022-23
CO-4	**32**	Numerical problems related to attenuation	**124**	If the fractional difference between core and cladding refractive indices of a fibre is 0.0135 and NA is 0.2425, Calculate the refractive indices of core and cladding materials.	2012-13
CO-4	**32**	Numerical problems related to attenuation	**125**	The optical power, after propagation through a fibre that is 500 m long is reduced to 25% of its original value. Calculate the fibre loss in dB/km.	2014-15
CO-4	**33**	Principle of laser	**126**	What is the principle of laser? or	2015-16 2019-20

				Explain the principle of laser by schematic diagram.	
CO-4	**33**	Principle of laser	**127**	State the characteristics of light	2019-20
CO-4	**33**	Principle of laser	**128**	What are necessary conditions of laser?	2012-13
CO-4	**33**	Principle of laser	**129**	What are main components of laser?	2021-22
CO-4	**33**	Absorption of radiation, Spontaneous and stimulated emission of radiation	**130**	Differentiate between spontaneous and stimulated emission of radiation. Which one is required for laser action? or What do you understand by stimulated emission of radiation in a laser?	2014-15 2017-18 2018-19 2022-23
CO-4	**33**	Absorption of radiation, Spontaneous and stimulated emission of radiation	**131**	What are important feature of stimulated emission? Obtain a relation between transition probabilities of stimulated and spontaneous emission.	2013-14
CO-4	**33**	Pumping	**132**	Define the term pumping.	2015-16
CO-4	**34**	Metastable state	**133**	Define metastable state.	2015-16 2016-17
CO-4	**34**	Population inversion	**134**	Define the population inversion in LASER.	2022-23
CO-4	**34**	Einstein's Coefficients	**135**	What are Einstein's coefficients? Establish a relation between them. Also discuss the essential conditions for laser action.	2013-14 2015-16 2016-17 2022-23
CO-4	**35**	Three and four level lasers	**136**	What do you understand by three and four level lasers? What is the advantage of three level laser over four level laser? or What are the conditions for production of laser beam in case of three level laser system?	2016-17 2018-19 2019-20
CO-4	**35**	Solid state Laser (Ruby Laser)	**137**	Describe the principle and working of Ruby laser system. Compare it with He-Ne laser. or What are solid state lasers? Explain construction and working of Ruby laser with suitable diagrams.	2015-16 2019-20 2022-23
CO-4	**36**	Gas Laser (He-Ne laser)	**138**	Illustrate the construction and working of He-Ne laser? Discuss important applications of laser.	2015-16 2016-17 2020-21

CO-4	**36**	Numerical related to Laser	**139**	Calculate the population ratio of two states in He-Ne laser that producers light of wavelength 6000A at 300K. or Calculate the relative population of two states of the laser that produces light of wavelength 5461 Å at 300 K. (Boltzmann constant k= 8.6 x 10^{-5} eV/K)	2013-14 2018-19 2019-20
CO-4	**36**	Numerical related to Laser	**140**	In a Ruby Laser, total number of Cr^{+3} ions is 2.8 x 10^{19}. If the laser emits radiation of wavelength 7000 Å , then calculate the energy of the laser pulse.	2015-16
CO-4	**36**	Numerical related to Laser	**141**	Calculate the energy and momentum of a photon of a laser beam of wavelength 6328 Å.	2019-20
CO-4	**36**	Numerical related to Laser	**142**	If the population ratio between two energy states in Ruby laser is 2 x 10^{-40}, emitting a light beam of wavelength 6943 Å. Find the temperature of energy states.	2015-16
CO-5	**37**	Superconductivity, Temperature dependence of resistivity in superconducting materials,	**143**	What is superconductivity? Discuss the temperature dependence of resistivity in superconducting materials.	2022-23
CO-5	**38**	critical magnetic field	**144**	Discuss the effect of external magnetic field on superconductors.	2022-23
CO-5	**38**	critical magnetic field	**145**	How the temperature affects the critical field of a superconductor?	2015-16
CO-5	**38**	critical magnetic field	**146**	Define transition temperature. Discuss the effect of external magnetic field on superconductors.	2016-17
CO-5	**38**	Type I and Type II superconductors	**147**	Describe type I and type II superconductors. Why are type-I superconductors poor current carrying conductors. or Explain Type I and Type II superconductors briefly. or What are superconductors? Explain their classifications as Type I and Type II superconductors.	2012-13 2013-14 2014-15 2016-17 2022-23
CO-5	**38**	Type I and Type II superconductors	**148**	Explain the important property that change during transition from Type I to Type II superconductor.	2016-17
CO-5	**38**	Meissner effect,	**149**	Discuss Meissner effect. Show that the perfect diamagnetism and zero resistivity are two independent and essential properties of the superconductor.	2013-14 2014-15 2017-18 2022-23
CO-5	**38**	Meissner effect,	**150**	What do you mean by Meissner effect? Explain how the Meissner effect proves the superconductor to be a perfect diamagnetic material?	2014-15 2022-23

CO-5	**38**	Persistent current	**151**	Discuss persistent current in super conductivity.	2022-23
CO-5	**39**	Applications of Super-conductors	**152**	Discuss the different applications of superconductors and explain qualitative account of high temperature superconductor. or Define high temperature superconductors	2016-17 2018-19 2016-17
CO-5	**39**	Properties of Super-conductors	**153**	Write any four properties of superconductors.	2022-23
CO-5	**40**	Numerical related to superconductor	**154**	Determine the critical current and critical current density for a wire of a lead having a diameter of 1 mm at temperature of 4.2K. Given the critical temperature for the lead is 7.18K and critical magnetic field is 6.5×10^{4} A m^{-1} .	2022-23
CO-5	**40**	Numerical related to superconductor	**155**	The transition temperature for Pb is 7.2K, however, at 5 K it losses the superconducting property subjected to a magnetic field of 3.3×10^{-4} A /m. Find the maximum value of H which allows the metal to retain its superconductivity at 0K.	2022-23
CO-5	**40**	Numerical related to superconductor	**156**	Explain the transition temperature and critical magnetic field. A superconducting material has a critical temperature of 3.7 K in zero magnetic field of 0.306 tesla at 0K. Find the critical field at 2 K.	2008-09 2013-14 2014-15 2015-16
CO-5	**40**	Numerical related to superconductor	**157**	The critical field for lead is 1.8×10^{6} A/m at 6 K and 2.4×10^{6} at 0K. Find the critical temperature of the material.	2015-16
CO-5	**40**	Numerical related to superconductor	**158**	Calculate the temperature at which the critical magnetic field is two-third of the value at 0 K for a tin superconductor with critical temperature 4 K.	2018-19
CO-5	**41**	Introduction and properties of nano materials	**159**	What are nano materials? Define their properties, what are nanoscience and nano technology	2013-14 2022-23
CO-5	**42**	Basics concept of Quantum Dots, Quantum wires and Quantum well	**160**	What do you mean by quantum well, quantum wire and quantum dots?	2022-23
CO-5	**43**	Fabrication of nano materials-Top-Down approach (CVD) and Bottom-Up approach (Sol Gel)	**161**	Explain the top down and bottom-up approach for the synthesis of nano materials. Discuss any one method (CVD/Sol-Gel) for the synthesis of nano materials.	2022-23
CO-5	**44**	Properties and Application of nano materials.	**162**	Describe the properties and potential applications of nano materials. What are the risks of using nano materials to human body?	2022-23