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| **Course Code** | **17PH2013 / 14PH2019** | **Duration** | **3hrs** |
| **Course Name** | **CONDENSED MATTER PHYSICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | | |
| 1. | a. | Describe the different types of polarization in solids with suitable sketch. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain in detail the band theory of solids with energy curve diagram. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Compare and contrast direct and indirect band gap semiconductors. | CO2 | U | 5 |
|  | b. | Derive Classius-Mosotti relation to relate the macroscopic dielectric constant with microscopic polarizabilities. | CO4 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Mention the Fermi-Dirac distribution function f(E) and define all the symbols in the relation. | CO5 | R | 5 |
|  | b. | Explain the temperature dependence of magnetism and ferromagnetism in detail. | CO6 | U | 15 |
|  |  |  |  |  |  |
| 5. | a. | Differentiate type I and type II superconductors. | CO3 | U | 5 |
|  | b. | Explain the BCS theory of superconductivity. | CO3 | U | 15 |
|  |  | (OR) |  |  |  |
| 6. | a. | Differentiate paramagnetic and ferromagnetic materials. | CO6 | U | 5 |
|  | b. | Explain the ferroelectric hysteresis loop with a suitable sketch. | CO5 | U | 15 |
|  |  |  |  |  |  |
| 7. | a. | Briefly describe types of crystal defects occur in solids. Explain Point line defects, point defects and surface defects with suitable diagram. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the different types of polarization in solids. | CO4 | U | 5 |
|  | b. | Explain the internal field or local field in liquids and solids with suitable sketch. | CO4 | U | 15 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | |
| 9. | a. | Derive the equation for net magnetization using quantum theory of magnetism. | CO6 | U&A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the band theory of solids |
| CO2 | Interpret the different types of semiconductors |
| CO3 | Define and explain the properties of superconductors |
| CO4 | Gain knowledge on dielectrics |
| CO5 | Appreciate the properties of ferroelectrics |
| CO6 | Explain the different types of magnetic materials |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 40 | - |  |  |  | 40 |
| CO2 | - | 25 | - |  |  |  | 25 |
| CO3 | - | 20 | - |  |  |  | 20 |
| CO4 | - | 35 | - |  |  |  | 35 |
| CO5 | 5 | 15 | - |  |  |  | 20 |
| CO6 | - | 40 | - |  |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **17PH3005** | **Duration** | **3hrs** |
| **Course Name** | **QUANTUM MECHANICS I** | **Max. marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss how the quantum mechanical ideas are introduced into the apparatus of linear vectors in linear vector space. | CO1 | U | 10 |
| b. | Give an account on the following,   1. Eigen function and eigen values 2. Normalization of wave function 3. Probability current density | CO1 | U | 10 |
| **(OR)** | | | | | |
| 2. | a. | State a Hermitian operator and discuss any two of its property in detail. | CO1 | U | 10 |
| b. | List and discuss the postulates of quantum mechanics. | CO1 | R | 10 |
| 3. | a. | Obtain and solve the time independent Schrodinger wave equation for a particle in a box. | CO2 | A | 15 |
|  | b. | An electron is trapped in a potential well of 0.1 nm length. Calculate the energy required to excite it from ground state to fifth excited state. | CO2 | An | 5 |
| **(OR)** | | | | | |
| 4. | a. | Find the Schrodinger wave equation for hydrogen atom and solve its radial part. | CO3 | An | 20 |
| 5. | a. | Give a detailed account on the commutation relations of total angular momentum with components. | CO4 | A | 20 |
| **(OR)** | | | | | |
| 6. | a. | Employ the angular momentum operator and its properties to find the eigen values of J+ and J- and the eigen values of Jx and Jy. | CO4 | A | 20 |
| 7. | a. | The first order energy correction for a perturbed non-degenerate system is the expectation value of the first order perturbed Hamiltonian over the unperturbed state. Validate. | CO5 | An | 20 |
| **(OR)** | | | | | |
| 8. | a. | Outline variation method and apply it to calculate the energy of the ground state helium atom. | CO6 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the Thomas-Fermi model that is used to describe the behavior of many electron systems. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Gain an in depth understanding on the central concepts and principles of quantum mechanics: the Schrödinger equation, the wave function and its physical interpretation, stationary and non-stationary states and expectation values. |
| CO2 | Improved mathematical skills necessary to solve differential equations and eigenvalue problems using the operator formalism |
| CO3 | Quantum mechanical solution of simple systems such as the harmonic oscillator and a particle in a potential well |
| CO4 | Grasp the concepts of spin and angular momentum, as well as their quantization- and addition rules. |
| CO5 | Student forms a mental picture on the meaning of linear combination of states within quantum mechanics |
| CO6 | Solutions to perturbation problems and many electron systems |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 | - | - | - | - | 40 |
| CO2 | - | - | 15 | 5 | - | - | 20 |
| CO3 | - | - | - | 20 | - | - | 20 |
| CO4 | - | - | 40 | - | - | - | 40 |
| CO5 | - | - | - | 20 | - | - | 20 |
| CO6 | - | 20 | 20 | - | - | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **17PH3021** | **Duration** | **3hrs** |
| **Course Name** | **MATERIAL CHARACTERIZATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How to find the crystallite size of thin films with powder X-ray diffraction method? Explain the principle and working of X-ray diffraction with a suitable diagram. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | What is the main use and the modes of Scanning Tunneling Microscope? Explain the instrumentation, and its use for imaging surfaces. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Discuss how the surface analysis is carried out using X-ray Photo electron Spectroscopy with a neat sketch and explain its working. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the transitions that a molecule undergoes and instrumentation of UV-Vis-IR absorption spectrophotometer. | CO2 | C | 20 |
|  |  |  |  |  |  |
| 5. | a. | How does photoluminescence spectroscopy measure the impurity levels and defect density? Explain the principle and working of photoluminescence with a band diagram and its instrumentation. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain how TEM is used as a modern technique for image magnification with a beam of electrons. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain how the physical and chemical properties of materials as a function of temperature are carried out using Thermo Gravimetric Analysis and Differential Thermal Analysis. | CO6 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the instrumentation and working principle of Differential Scanning Calorimetry for the measurement of specific heat capacity. | CO5 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | What is Hall Effect? In semiconductor technology how the two probe and four probe conductivity methods are carried out? | CO2 | E | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify suitable techniques for specific materials characterization. |
| CO2 | Use various instrumentations to scan and test materials for electrical, mechanical and thermal property analysis. |
| CO3 | Analyse the structurual and compositional properties of materials using XRD, SEM, XPS, EDAX and AFM. |
| CO4 | Apply the microscopic and macroscopic property analysis for various materials. |
| CO5 | Analyse the magnetic properties of materials and functions. |
| CO6 | Practice the testing of materials for various thermal property analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 | 40 |  |  |  | 60 |
| CO2 |  |  |  |  | 20 | 20 | 40 |
| CO3 |  |  |  | 20 |  |  | 20 |
| CO4 |  |  |  | 20 |  |  | 20 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 |  |  | 20 |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **17PH3022** | **Duration** | **3hrs** |
| **Course Name** | **CRYSTAL GROWTH TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discover the usefulness of crystal growth in the field of semiconductor fabrication technology. | CO1 | A | 10 |
|  | b. | Define the term “crystallization”. Analyze the methods available for crystal growth. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the classical theory of nucleation and argue the effects and influence of soluble impurities in the process of nucleation. | CO2 | An | 20 |
|  |  |  |  |  |  |
| 3. | a. | Discuss about the preparation of saturation and super saturation in solution growth technique and conclude the remarks. | CO2 | A | 5 |
|  | b. | Describe the process of growing crystals using low temperature solution growth technique. Discuss its conditions. | CO2 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the following.   1. Accelerated crucible rotation method 2. Solvent evaporation method 3. Float zone method | CO3 | E | 20 |
|  |  |  |  |  |  |
| 5. | a. | Describe the different methods of crystal growth and how do you choose the method based on phase diagram in melt growth? | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Demonstrate the growth of oxide single crystals using versatile flux growth method. | CO6 | C | 20 |
|  |  |  |  |  |  |
| 7. | a. | Describe the process of Zone melting technique. | CO4 | An | 5 |
|  | b. | Describe the process of pulling technique using Czochralski method with a neat sketch of instrumentation. | CO5 | A | 15 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain about Horizontal and Vertical Bridgman technique for growth of good quality single crystals. | CO6 | R | 12 |
|  | b. | Describe the Vernueil technique for crystal growth with a schematic diagram. | CO6 | An | 8 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Summarize the types of vapour growth processes. Discuss the PVD and CVD methods with suitable diagram. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Students can understand the different techniques used for growing crystals |
| CO2 | To review physics and chemistry in the context of material science and engineering |
| CO3 | To describe the different types of bonding in solids, and the physical ramification of these differences. |
| CO4 | To describe and demonstrate diffraction, including interpretation of basic x-ray data. |
| CO5 | To describe introduction to metals, ceramics, polymers and electronic materials in the context of a molecular level understanding of bonding. |
| CO6 | To give an introduction to the relation between processing, structure and physical properties. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 10 | 10 |  |  |  | 20 |
| CO2 |  | 15 | 5 | 20 |  |  | 40 |
| CO3 | 20 |  |  |  | 20 |  | 40 |
| CO4 |  |  |  | 5 |  |  | 5 |
| CO5 |  |  | 15 |  |  |  | 15 |
| CO6 | 12 |  | 20 | 8 |  | 20 | 60 |
|  | | | | | | | **180** |



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| **Course Code** | **18PH1009** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED PHYSICS AND PROPERTIES OF MATTER** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Laser is an acronym for   1. Light Amplification by Stimulated Emission of Radiation. 2. Light Attenuation by Stimulated Emission of Radiation. 3. Light Amplification by Spontaneous Emission of Radiation. 4. Light Attenuation by Spontaneous Emission of Radiation. | | CO1 | R | 1 |
| 2. | The three distinctive processes that can happen in laser are   1. Spontaneous absorption, spontaneous emission, stimulated emission. 2. Stimulated absorption, spontaneous emission, stimulated interference 3. Stimulated absorption, spontaneous emission, stimulated diffraction. 4. Stimulated absorption, spontaneous emission, stimulated emission. | | CO1 | U | 1 |
| 3. | Refractive index is defined as the ratio between\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_.   1. Speed of light in water, speed of light in medium. 2. Speed of light in solid, speed of light in medium. 3. Speed of light in medium, speed of light in vacuum. 4. Speed of light in vacuum, speed of light in medium. | | CO2 | R | 1 |
| 4. | Refraction is the phenomenon in which light behaves like the following.   1. Light bends when it travels one medium to another medium of same refractive indices. 2. Light bends when it travels one medium to another medium of different refractive indices. 3. Light doesn’t bend when it travels one medium to another medium of different refractive indices. 4. Light bends when traveling around narrow edges. | | CO2 | U | 1 |
| 5. | De Broglie wavelength is independent of the \_\_\_\_\_\_\_ of the particle.   1. Charge. 2. Mass. 3. Velocity. 4. Momentum. | | CO3 | R | 1 |
| 6. | There is an uncertainty in measuring the position and momentum simultaneously because   1. The experiment is at fault. 2. The person doing the experiment is not a skilled person. 3. The errors are due to defective instruments. 4. It is an inherent nature of atomic world. | | CO3 | U | 1 |
| 7. | If the reverberation time is too short, the following unwanted effect will happen inside an auditorium.   1. All of the others. 2. Dead sound. 3. Difficulty hearing in back. 4. Loss of bass in back. | | CO4 | R | 1 |
| 8. | Sound travels faster in \_\_\_\_\_\_ medium.   1. Liquid. 2. Gaseous. 3. Solid. 4. Colloidal. | | CO4 | U | 1 |
| 9. | Calculate the speed of ultrasound in ethyl alcohol if the distance between two adjacent nodes ‘d’ is 2.211 x 10-4 m and the frequency of the ultrasound produced is 2.73 x 106 Hz.   1. 1207 m2/s. 2. 1207 m/s. 3. 1207 m/s2. 4. 1207 m2/s2. | | CO5 | R | 1 |
| 10. | Longitudinal Waves (Ultrasound wave propagation) are also known as \_\_\_\_\_.   1. Shear Waves. 2. Water Waves. 3. Compressional Waves. 4. Surface Waves. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Define population inversion. | | CO1 | U | 3 |
| 12. | The refractive indices for core and cladding for a step index fiber are 1.452 and 1.321 respectively. Calculate critical angle and acceptance angle. | | CO2 | A | 3 |
| 13. | State Hook’s Law | | CO3 | U | 3 |
| 14. | An electron initially at rest is accelerated through a potential difference of 400 V. Compute   1. The velocity of electron 2. The de Broglie wavelength | | CO4 | A | 3 |
| 15. | Explain the term “Reverberation Time”. | | CO5 | U | 3 |
| 16. | Longitudinal standing waves are set up in a quartz plate with antinodes at opposite faces. The fundamental frequency of vibration is given by the relation f = 2.87 x 103/t, where f is in Hz and t is the thickness of the plate in meter. Compute the young’s modulus of the quartz plate. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss in detail, the construction, principle and working of He-Ne laser with energy level diagram. | CO1 | A | 10 |
|  | b. | Calculate the band gap energy for a GaAs semiconductor laser if the wavelength of laser emitted by it is 0.4141 μm. | CO1 | A | 2 |
|  |  |  |  |  |  |
| 18. | a. | Derive an expression for numerical aperture in terms of refractive indices of core and cladding of an optical fiber cable. | CO2 | An | 10 |
|  | b. | A graded index fiber has a core diameter of 60 μm and numerical aperture of 0.12 at a wavelength of 750 nm. Find the normalized frequency. | CO2 | An | 2 |
|  |  |  |  |  |  |
| 19. | a. | Elaborate on Lee’s disc method for finding the thermal conductivity of a bad conductor. | CO3 | A | 10 |
|  | b. | Name the various types of elastic moduli. | CO3 | A | 2 |
|  |  |  |  |  |  |
| 20. | a. | Prove the existence of electron matter waves with Davisson Germer experiment. Give the construction, working, theoretical and experimental calculations and conclusion of Davisson Germer experiment in detail. | CO4 | An | 10 |
|  | b. | An electron is confined to an atom of radius 10-11m. Calculate the minimum uncertainty in its momentum. | CO4 | An | 2 |
|  |  |  |  |  |  |
| 21. | a. | The total absoroption of a large hall is given by the expression EvA/4. Starting from this factor, find an expression for growth and decay of sound energy and hence, deduce Sabine’s formula for reverberation time. | CO5 | An | 10 |
|  | b. | The intensity of sound in a street during heavy traffic is  10-4 W m-2. Calculate the relative intensity in decibel. | CO5 | An | 2 |
|  |  |  |  |  |  |
| 22. | a. | From the first principles and assumptions, derive an expression for Schrodinger’s time independent wave equation. | CO1 | R | 10 |
|  | b. | Compute the ground state energy of an electron trapped in a box of length 1 Å. | CO2 | R | 2 |
|  |  |  |  |  |  |
| 23. | a. | Name the factors affecting the acoustics of a good auditorium and explain how these effects can be minimized by suggesting suitable solutions for the same. | CO3 | U | 10 |
|  | b. | A small auditorium has a volume of 1500 m3. Its total absorption is equivalent to 150 m2 of open window. Find the reverberation time. | CO4 | U | 2 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Define the inverse piezoelectric effect and with a neat circuit diagram, explain how ultrasonic waves can be produced by this method. | CO | E | 10 |
|  | b. | Calculate the speed of ultrasound in mercury if the distance between two adjacent anti-nodes ‘d’ is 2.656 x 10-4 m and the frequency of the ultrasound produced is 2.73 x 106 Hz. | CO | E | 2 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To impart knowledge on the working principle of various lasers and its application in Fibre. |
| CO2 | Apply the relationship between properties of matter and the thermal physics. |
| CO3 | To impart knowledge on the basic concepts of quantum mechanics and its application. |
| CO4 | To impart knowledge on principles of acoustics and applications of ultrasonic waves. |
| CO5 | Design devices based on ultrasonic generators |
| CO6 | To acquire knowledge of fundamentals of properties of matter. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 7 | 4 | 12 | --- | --- | --- | **23** |
| CO2 | 7 | 1 | 3 | 12 | --- | --- | **23** |
| CO3 | 1 | 10 | 12 | --- | --- | --- | **23** |
| CO4 | 1 | 7 | 3 | 12 | --- | --- | **23** |
| CO5 | 1 | 4 | --- | 12 | --- | --- | **17** |
| CO6 | -- | --- | 3 | --- | 12 | --- | **15** |
|  | | | | | | | **124** |



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| **Course Code** | **20OP2001** | **Duration** | **3hrs** |
| **Course Name** | **PHYSICAL AND GEOMETRICAL OPTICS I** | **Max. Marks** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| 1. | a. | Derive the Huygen’s wave theory. | CO1/R | 10 |
|  | b. | Discuss the laws of reflection and refraction. Represent the propagation of waves using ray model. | CO1/A | 10 |
| **(OR)** | | | | |
| 2. | a. | State the Fermat’s principle and discuss the properties of light. | CO2/U | 20 |
|  |  |  |  |  |
| 3. | a. | Discuss the theory of Newton’s rings with an experiment. | CO1/E | 20 |
| **(OR)** | | | | |
| 4. | a. | Explain the formation of waves with constructive and destructive interference. | CO2/A | 20 |
|  |  |  |  |  |
| 5. | a. | Describe the Fresnel’s and Fraunhoffer diffraction due to a single slit. | CO3/C | 10 |
|  | b. | How the different types of polarized light can be distinguished. | CO4/E | 10 |
| **(OR)** | | | | |
| 6. | a. | Discuss the different types of zone plates. | CO5/U | 8 |
|  | b. | Explain how Nicol prism can be used as an analyzer. | CO4/E | 12 |
|  |  |  |  |  |
| 7. | a. | Give an account of emission and absorption spectra. | CO4/An | 20 |
| **(OR)** | | | | |
| 8. | a. | Discuss the properties and LASER and give an account of Raman spectrum analysis. | CO5/A | 20 |
|  |  |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | Discuss the formulas of obtaining resolving power of optical instruments. | CO6/E | 10 |
|  | b. | With a schematic diagram, explain Michelson interferometer. | CO6/C | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the usage of various theories and components of light. |
| CO2 | Report the effect of interference of light on lenses. |
| CO3 | Apply knowledge of combination of optical principles such as interference, diffraction, polarization in optical elements. |
| CO4 | Design an optical system, component to meet desired needs of optometry. |
| CO5 | Solve problems in optical physics and lens assembly. |
| CO6 | Demonstrate the techniques, skills, and modern tools necessary for optical physics in analytical instruments. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 |  | 10 |  | 20 |  | 40 |
| CO2 |  | 20 | 20 |  |  |  | 40 |
| CO3 |  |  |  |  |  | 10 | 10 |
| CO4 |  |  |  | 20 | 22 |  | 42 |
| CO5 |  | 8 | 20 |  |  |  | 28 |
| CO6 |  |  |  |  | 10 | 10 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2002** | **Duration** | **3hrs** |
| **Course Name** | **GENERAL ANATOMY AND GENERAL PHYSIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | List out the directional terms used in describing the position of structures relative to other structures or locations in the body. | CO3 | R | 3 |
|  | b. | Classify the different planes of the human body. | CO3 | U | 7 |
|  | c. | Interpret the bones that are associated with the eye orbit among the eight cranial and fourteen facial bones. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | List the functions of skeletal system. | CO2 | R | 3 |
|  | b. | Classify the types of muscles with examples. | CO2 | U | 7 |
|  | c. | Interpret the functioning of the heart with a neat diagram and mention the role of ophthalmic artery. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Define Tissue. | CO6 | R | 3 |
|  | b. | Discuss the role of villi and microvilli in human eyes. | CO6 | U | 7 |
|  | c. | Compare the different types of epithelial tissues and type of epithelial cell that forms the first layer of cornea. | CO6 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Name the type of tissue that supports, protects, and gives structure to other tissues and organs in the body. | CO6 | R | 3 |
|  | b. | Explain the location and role of meibobian and lacrimal glands in human eye. | CO6 | U | 7 |
|  | c. | Analyze the location of recently discovered Dua layer in cornea and mention the role of each layer of the cornea. | CO6 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Mention the two types of Homeostasis. | CO2 | R | 3 |
|  | b. | Discuss the role of RBC, WBC and platelets. | CO2 | U | 7 |
|  | c. | Interpret the role of Homeostasis in body temperature regulation. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | State the role of osmatic pressure in the body fluid movement. | CO2 | R | 3 |
|  | b. | Describe the mechanism of fluid movement among the body fluid compartments. | CO2 | U | 7 |
|  | c. | With a neat diagram, show the composition of body fluid compartments. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Define lung volume. | CO3 | R | 3 |
|  | b. | Discuss the structure of Nephron with a neat diagram. | CO3 | U | 7 |
|  | c. | Explain the role of each parts of a kidney with a diagram on its structure. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Give the other name for food canal. | CO4 | R | 3 |
|  | b. | Interpret the role of Villus in the absorption of food in the small intestine. | CO1 | U | 7 |
|  | c. | Draw the digestive system and compare the role of each part in food digestion. | CO4 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Define Nerves. | CO5 | R | 3 |
|  | b. | Differentiate the Autonomic and Somatic nervous systems. | CO5 | U | 7 |
|  | c. | Label the parts of Neuron and analyze the role of Synapse in signal transmission. | CO5 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recall outline on cells, their functions and membrane transportation of cells. |
| CO2 | Understand the composition of blood and its function on maintaining homeostasis. |
| CO3 | Elaborate the components of respiratory and cardiovascular systems. |
| CO4 | Describe about the anatomical locations, structures and their physiological functions. |
| CO5 | Analyse the structure and functions of nervous system and parts of brain. |
| CO6 | Evaluate the functions of eye, ear and kidney. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 7 |  |  |  |  | 7 |
| CO2 | 6 | 14 | 20 |  |  |  | 40 |
| CO3 | 3 | 7 | 10 |  |  |  | 20 |
| CO4 | 9 | 14 | 10 | 10 |  |  | 43 |
| CO5 | 3 | 7 |  | 10 |  |  | 20 |
| CO6 | 6 | 14 |  | 30 |  |  | 50 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2007** | **Duration** | **3hrs** |
| **Course Name** | **COMPUTING AND COMPUTER APPLICATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Impact printers print by striking device against inked ribbon, Validate with their characteristics and classify them in detail. | CO1 | U | 15 |
| b. | Define a computer system and illustrate the input process output (IPO) cycle with a neat diagram. | CO1 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Give an account on the following.   1. Optical Mark Reader (OMR) 2. Optical Character Recognition (OCR) 3. Magnetic Ink Character Recognition (MICR) | CO1 | U | 15 |
| b. | Mention the characteristics of computers. | CO1 | R | 5 |
|  |  |  |  |  |  |
| 3. | a. | Discuss about networking and classify them based on their geographical area. | CO2 | An | 15 |
| b. | List some features of system software. | CO2 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Distinguish local area network based on their component role. Mention their advantages and disadvantages. | CO2 | An | 15 |
| b. | Classify and discuss about the different types of servers. | CO2 | U | 5 |
|  |  |  |  |  |  |
| 5. | a. | Differentiate in detail between compilers and interpreters. | CO3 | U | 10 |
| b. | Compare and appraise linux with other operating systems. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Elaborate on the basic features and components of a linux operating system. | CO3 | U | 15 |
| b. | Report on the different phases of SDLC. | CO3 | A | 5 |
|  |  |  |  |  |  |
| 7. | a. | Recognize the different types of operators used in C program and explain them in detail. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Give a detailed account on the following,   1. Pointers 2. Structures | CO4 | R | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Mention the features and significance of object oriented programming. | CO5 | R | 10 |
| b. | Explain the concept of inheritance and polymorphism in C++. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the history of computers and its characteristics. |
| CO2 | Understand the functions of different ports in hardware and software tools |
| CO3 | Apply the knowledge on office applicate suite for programming specific cases. |
| CO4 | Interpret the functions, arrays, union, structures and pointers in C language. |
| CO5 | Analyze specific clinical data required for the history of individuals |
| CO6 | Evaluate the data for any specific conditions to process for further references and data processing. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 30 |  |  |  |  | 40 |
| CO2 | 5 | 5 |  | 30 |  |  | 40 |
| CO3 |  | 25 | 5 | 10 |  |  | 40 |
| CO4 | 20 |  | 20 |  |  |  | 40 |
| CO5 | 10 |  |  |  |  |  | 10 |
| CO6 |  | 10 |  |  |  |  | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2008** | **Duration** | **3hrs** |
| **Course Name** | **NUTRITION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the history of nutrition in brief. | CO1 | U | 6 |
|  | b. | Illustrate different type of foods and food groups in detail with necessary examples. | CO1 | A | 14 |
|  |  | (OR) |  |  |  |
| 2. | a. | Discuss the limitations of daily diet for various age groups in detail. | CO1 | R | 6 |
|  | b. | Differentiate macro and micro nutrient in detail. Discuss the important functions of food nutrients in detail. | CO1 | An | 14 |
|  |  |  |  |  |  |
| 3. | a. | Describe the problems related to deficiency and excess of nutrient Carbohydrate in human body. | CO2 | R | 6 |
|  | b. | Explain the various types, sources and functions of the nutrient Carbohydrate with adequate examples | CO2 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe recommended dietary allowance of carbohydrate for human eye. | CO2 | U | 6 |
|  | b. | Explain resistant starch in brief and differentiate it with regular starch. Also describe the benefits of high-fibre diet and the health conditions linked to low dietary fibre. | CO2 | A | 14 |
|  |  |  |  |  |  |
| 5. | a. | Differentiate complete and incomplete proteins with necessary examples | CO3 | U | 6 |
|  | b. | Illustrate essential and non-essential amino acids in detail. Discuss various function and food sources of proteins with few examples. | CO3 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the requirement of supplementary food for the health of an eye in detail. | CO3 | A | 6 |
|  | b. | Explain the three main classification of protein in detail with relevant diagrams and examples. | CO3 | An | 14 |
|  |  |  |  |  |  |
| 7. | a. | Differentiate various types of lipids based on bio-chemical classification of fats with necessary examples. | CO4 | U | 6 |
|  | b. | Illustrate saturated and unsaturated in detail. Also discuss the sources of Omega 3 fatty acids and its health benefits in brief. | CO4 | A | 14 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe energy imbalance in detail leading to obesity and starvation. | CO5 | R | 6 |
|  | b. | Explain various food sources of fats and its functions and in detail. Also, explain the total calorie requirement for different age groups and associated diseases due to the deficiency of fats. | CO5 | U | 14 |
|  |  | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | |
| 9. | a. | Discuss vitamin deficiencies and its associated eye disorders in detail. | CO6 | A | 6 |
|  | b. | Explain the macro and micro minerals with examples. Differentiate various types of vitamins and discuss its importance and general functions in the health of human eye. | CO6 | An | 14 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the importance of balanced food and food groups. |
| CO2 | Classify the carbohydrates, Fats and proteins and its presence in different sources. |
| CO3 | Demonstrate the role of Macro and micro minerals associated with the eye defects |
| CO4 | Measure the energy value of food, Energy expenditure. |
| CO5 | Calculate the total energy/calorie requirement for different age groups and diseases. |
| CO6 | Recommend suitable diet plan for a specific case related to different conditions of eye |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 6 | 14 | 14 |  |  | 34 |
| CO2 | 6 | 6 | 14 | 14 |  |  | 40 |
| CO3 |  | 6 |  | 14 |  |  | 20 |
| CO4 | 6 | 6 | 6 | 14 |  |  | 32 |
| CO5 | 6 | 14 | 14 |  |  |  | 34 |
| CO6 |  |  | 6 | 14 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2011** | **Duration** | **3hrs** |
| **Course Name** | **OPTOMETRIC OPTICS I** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Categorize lenses based on various forms and brief each of them. | CO1 | U | 5 |
|  | b. | How does a sphero-cylindrical lens differ from a cylindrical lens and a spherical lens in terms of correcting vision problems? Discuss the characteristics and the power distribution in each of these lens types. | CO6 | A | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Clarify how does chromatic aberration in ophthalmic lenses impact the quality of vision and color perception. | CO6 | An | 5 |
|  | b. | Name the various types of optical aberration in ophthalmic lenses. Explain each and suggest the methods to correct those aberrations. | CO6 | A | 15 |
|  |  |  |  |  |  |
| 3. | a. | Explain the generation process for manufacturing optical surfaces. | CO3 | U | 5 |
|  | b. | Describe the key steps and techniques involved in the lens surfacing process for ophthalmic lenses with neat sketches. | CO3 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write the various steps involved in the manufacturing of ophthalmic glass lens blank. | CO3 | U | 5 |
|  | b. | Illustrate the critical steps and considerations involved in the finishing process of ophthalmic lenses. | CO3 | U | 15 |
|  |  |  |  |  |  |
| 5. | a. | Suggest the methods to rectify the defects in ophthalmic lenses. | CO4 | An | 5 |
|  | b. | List the common defects that can occur in the material of ophthalmic lenses. How do these defects impact the optical quality, durability, and safety of the lenses? | CO4 | A | 15 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | How is the quality of ophthalmic lenses inspected to ensure they meet optical standards and patient safety? What are the key factors examined during this inspection process? | CO4 | An | 5 |
|  | b. | Explain the following regarding toughened ophthalmic lenses.   1. Properties (ii) Advantages (iii) Thermal Process 2. Chemical Process | CO4 | U | 15 |
|  |  |  |  |  |  |
| 7. | a. | Brief ophthalmic prism and prism orientation with diagrams. | CO2 | U | 5 |
|  | b. | Provide an overview of different types of strabismus and explain the use of prisms in their management. | CO2 | A | 15 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define and write the key points on prismatic effect. | CO2 | U | 5 |
|  | b. | Discuss the decentration of spherical and cylindrical lenses based on the context of prismatic effect. | CO6 | A | 15 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the following   1. Construction of spectacle frames 2. Measurement of spectacle frames 3. Markings on spectacle frames | CO5 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the types of optical lenses |
| CO2 | Understand the properties of optical lenses through laws of physics |
| CO3 | Apply the knowledge on optical properties in lens manufacturing |
| CO4 | Analyze the quality of lenses |
| CO5 | Identify the type of spectacle frames |
| CO6 | Appreciate the knowledge gained on optical lenses to solve vision problems |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 5 |  |  |  |  | 5 |
| CO2 |  | 10 | 15 |  |  |  | 25 |
| CO3 |  | 40 |  |  |  |  | 40 |
| CO4 |  | 15 | 15 | 10 |  |  | 40 |
| CO5 |  |  | 20 |  |  |  | 20 |
| CO6 |  | 45 | 5 |  |  |  | 50 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2012** | **Duration** | **3hrs** |
| **Course Name** | **OCULAR DISEASES I** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the congenital and developmental anomalies of the eyelids. | CO1 | A | 10 |
|  | b. | Describe the following diseases (i) Blepharospasm (ii) Blepharitis (iii) Trichiasis (iv) Symblepharon. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the gross anatomy of eyelids. | CO1 | C | 10 |
|  | b. | Discuss the types of inflammations happens in the eyelid area. | CO1 | E | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the lacrimal system with a neat diagram. | CO2 | R | 10 |
|  | b. | Write short notes on dermis and epidermis of eye lids, write short notes on chalazion | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write short notes on (i) Ectasia (ii) Staphyloma (iii) Scleritis (iv) Episcleritis. | CO2 | An | 20 |
|  |  |  |  |  |  |
| 5. | a. | What is an orbit in eye? Discuss about the congenital and developmental anomalies of orbit with neat diagram. | CO3 | E | 10 |
|  | b. | Discuss some information on the orbital inflammation with any mechanism, symptoms and its treatment. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe in detail about Orbital tumours and its types. | CO3 | An | 10 |
|  | b. | Describe in detail about blow out fracture. Write about the sinus disorders which affects the eye. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Write short notes about Allergic conjunctivitis and explain (i)Simple allergic conjunctivitis,  ii) Vernal kerato conjunctivitis,  iii) Atopic kerato conjunctivitis | CO4 | R | 10 |
|  | b. | Describe the anatomy of conjunctiva. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write about Vernal Kerato conjunctivitis and any two clinical classification of bacterial conjunctivitis. | CO5 | An | 10 |
|  | b. | Write short notes on conjunctival degenerations  i) Pterygium, ii) Ocular Phemighoid. | CO4 | R | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe Tumors in Eye with special reference to Iris and pupil. | CO6 | An | 10 |
|  | b. | Describe the diseases of the choroid. | CO6 | A | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the anatomy of eye |
| CO2 | Understand the functioning of eyes |
| CO3 | Apply the knowledge of eye anatomy in finding the eye tumors |
| CO4 | Analyze the quality of vision through eye anatomy |
| CO5 | Identify the type of eye tumor, conjunctiva and cornea |
| CO6 | Appreciate the knowledge gained on eye anatomy in rectifying the problems in eye vision due to tumours and trauma. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 10 | 10 | 10 | 10 | 40 |
| CO2 | 10 |  | 10 | 20 |  |  | 40 |
| CO3 | 10 |  | 10 | 10 | 10 |  | 40 |
| CO4 | 20 |  |  |  |  |  | 20 |
| CO5 |  |  | 10 | 10 |  |  | 20 |
| CO6 |  |  | 10 | 10 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2013** | **Duration** | **3hrs** |
| **Course Name** | **VISUAL OPTICS 1** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the term ‘conjugacy’ in geometric optics. | CO1 | U | 6 |
|  | b. | Explain the spherical refracting surfaces in detail and discuss the sign conventions in detail. | CO1 | A | 14 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Define Vertex and center of curvature in spherical mirrors with diagram. | CO1 | R | 6 |
|  | b. | Compare and contrast various cardinal points of an optical system in detail with required diagram. | CO1 | An | 14 |
|  |  |  |  |  |  |
| 3. | a. | Explain the structure of crystalline lens and its function in detail with a neat diagram. | CO2 | R | 6 |
|  | b. | Illustrate six layers of cornea with a neat diagram and explain its structure and functions in detail. | CO2 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe a method to measure the corneal curvature in brief. | CO2 | U | 6 |
|  | b. | Illustrate the part ‘vitreous humor’ in ocular structure with a neat diagram. Discuss its compositions and functions in detail. | CO2 | A | 14 |
|  |  |  |  |  |  |
| 5. | a. | Compare and contrast the optic axis, visual axis and fixation axis in detailed diagram along with its corresponding angles of eye. | CO3 | U | 6 |
|  | b. | Illustrate the functioning of a Keratometer in the measurement of the reflected image to assess the corneal curvature of the eye. | CO3 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the characteristics of corneal curvature and thickness of human eye. | CO3 | A | 6 |
|  | b. | Illustrate ultrasonography and Tscherning’s methods of Phakometry in the analysis of curvature of the lens in detail. | CO3 | An | 14 |
|  |  |  |  |  |  |
| 7. | a. | Describe the various kinds of anomalies present in refractive errors of ocular structures. | CO4 | U | 6 |
|  | b. | Illustrate the populating distribution of anomalies of refractive errors present in children, adults and old age in detail. Discuss various ways to prevent and treat it clinically. | CO4 | A | 14 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the cause and risk factors involved due to the refractive errors in detail. | CO5 | R | 6 |
|  | b. | Examine the aetiological parameters of refractive anomalies in detail for the refractive errors hyperopia, presbyopia and myopia. | CO5 | U | 14 |
| **COMPULSORY QUESTION** | | | | | |  | **Compulsory**: |  | **Compulsory**: |
| 9. | a. | Analyze how the refractive errors vary during the growth of eye for the ages between 5 and 60. | CO6 | A | 6 |
|  | b. | Explain the optical component of the ocular system and its measurements related to Anterior chamber and the Retina. Also describe the characteristics and limitations of the optical components in brief. | CO6 | An | 14 |

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the physical laws in geometric optics. |
| CO2 | Understand the optics of ocular structures. |
| CO3 | Apply the knowledge of optics in measurement of optical constants of the eye. |
| CO4 | Analyze the quality of vision through eye anatomy. |
| CO5 | Evaluate the refractive anomalies. |
| CO6 | Appreciate the knowledge gained on visual optics in treatment of eye problems. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 6 | 6 | 14 | 14 |  |  | 40 |
| CO2 | 6 | 6 | 14 | 14 |  |  | 40 |
| CO3 |  | 6 |  | 14 |  |  | 20 |
| CO4 | 6 |  | 6 | 14 |  |  | 26 |
| CO5 | 6 | 14 | 14 |  |  |  | 34 |
| CO6 |  |  | 6 | 14 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2014** | **Duration** | **3hrs** |
| **Course Name** | **OCULAR ANATOMY AND OCULAR PHYSIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Tabulate the primary, secondary and tertiary functions of extra ocular muscles. | CO1 | R | 10 |
|  | b. | Explain the origin and innervations of extra ocular muscles. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain anatomy of lacrimal apparatus system, lacrimal glands and accessory lacrimal glands. | CO1 | U | 10 |
|  | b. | Explain the following terms:   1. Tear film 2. Layers of tear film 3. Secretion and drainage of tear 4. Functions of tear film | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the anatomy of aqueous humour, structures involved in anterior chamber and anterior chamber angle with grading. | CO2 | A | 10 |
|  | b. | Explain with diagram   1. Formation of aqueous humour 2. Drainage of aqueous humour | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Mention the reason for transparent nature of cornea. | CO2 | R | 5 |
|  | b. | Explain the following terms in detail.   1. Cornea anatomy 2. Refractive power 3. Refractive index 4. Corneal curvature 5. Layers of cornea | CO2 | U | 15 |
|  |  |  |  |  |  |
| 5. | a. | Define presbyopia and tabulate the addition power prescribed for different age group. | CO3 | An | 10 |
|  | b. | Define the following terms.   1. Accommodation 2. Range of accommodation 3. Amplitude of accommodation 4. Depth of field 5. Depth of focus | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain in detail with suitable diagram.   1. Anatomy of lens 2. Parts of lens 3. Physiology of lens 4. Transparency of lens | CO3 | U | 15 |
|  | b. | Discuss in detail the changes of lens during accommodation. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 7. | a. | Analyze in detail the afferent pupillary defects.   1. TAPD 2. RAPD 3. Wernicke’s pupil | CO4 | An | 10 |
|  | b. | Explain in detail Horner’s syndrome and its evaluation. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain in detail the parasympathetic light reflex pathway with diagram. | CO4 | U | 10 |
|  | b. | Discuss in detail, the pupillary reflexes and morphological abnormalities of pupil. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain visual pathway with diagram. | CO6 | U | 10 |
|  | b. | Explain the different layers of retina with a neat sketch and mention its functions. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the working of eye lid, lacrimal apparatus and extra ocular muscles. |
| CO2 | Understand the cornea aqueous secretion and dynamics. |
| CO3 | Apply the knowledge of crystalline lens and accommodation for curing eye anomalies. |
| CO4 | Analyze the quality of iris and pupil. |
| CO5 | Evaluate the problems associated with retina and acuity of vision. |
| CO6 | Appreciate the knowledge gained on ocular physiology in rectifying defects in color vision. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 |  |  |  |  | 40 |
| CO2 | 5 | 35 | 10 |  |  |  | 50 |
| CO3 |  | 20 |  | 10 |  |  | 30 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2015** | **Duration** | **3hrs** |
| **Course Name** | **PATHOLOGY AND MICROBIOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss on anatomy and physiology of optic nerve with illustrations. | CO1 | U | 10 |
|  | b. | Describe the incidence and basic mechanism of ocular tuberculosis. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the mechanism of an intraocular tumor – choroidal melanoma. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Classify the condition of leukemia and the underlying mechanism with respect to ophthalmic infections. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Summarize on bleeding disorders in hematology. | CO2 | U | 10 |
|  | b. | Write about examination of urine and blood smears in clinical pathology. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the mechanism of orbit inflammation and neoplasia. | CO5 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the physiology of degeneration and dystrophies and its associated disorders. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Categorize the various nutritional requirements of Bacteria. | CO4 | A | 10 |
|  | b. | Recall the types of different media used for Bacterial culture. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss the morphology and identification of a Bacterial Cell. | CO4 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Assess and reflect the pathology of Ophthalmic Infections occurring in the Eye with respect to: |  |  |  |
|  | a. | Ocular viral Infections. | CO6 | E | 10 |
|  | b. | Ocular fungal Infections. | CO6 | E | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recall the diseases associated with eyes. |
| CO2 | Understand the science of hematology. |
| CO3 | Understanding the pathology of cataract. |
| CO4 | Apply the knowledge of morphology of bacterial cell in testing the eyes. |
| CO5 | Analyze the quality of vision through basic immunology studies. |
| CO6 | Identify the type of eye tumor and treatment with a thorough knowledge on pathology and microbiology. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 40 |  |  |  |  | 40 |
| CO2 |  | 30 | 10 |  |  |  | 40 |
| CO3 |  | 20 |  |  |  |  | 20 |
| CO4 | 10 | 20 | 10 |  |  |  | 40 |
| CO5 | 20 |  |  |  |  |  | 20 |
| CO6 |  |  |  |  | 20 |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2018** | **Duration** | **3hrs** |
| **Course Name** | **OPTOMETRIC OPTICS II** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Paraphrase the following.   1. Plastic tinted lens 2. Integral tint 3. Gradient and double gradient tint | CO1 | U | 12 |
|  | b. | Tinted lenses are in different colors: Name and explain the characteristics of them. | CO1 | A | 8 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the methods involved in tinting of absorptive lenses. | CO1 | A | 12 |
|  | b. | Describe the following   1. Absorptive lenses and its classification. 2. Effects of UV radiation 3. Effects of infrared radiation | CO1 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Illustrate mineral and organic photochromic lenses in detail. | CO2 | A | 12 |
|  | b. | Demonstrate the procedure to construct polarized lens and list the advantages and disadvantages of such lenses. | CO2 | A | 8 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Classify the bifocal lenses based on manufacturing and segment. Explain each of them with neat sketches. | CO2 | A | 12 |
|  | b. | Discuss about trifocal lenses with guidelines to use them. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 5. | a. | Explain the following in the case of progressive addition lenses  (i) Need and definition (ii) Anatomy (iii) Advantages and disadvantages (iv) Markings | CO2 | U | 12 |
|  | b. | Illustrate various PAL designs. | CO5 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Analyze the formation of ghost images in detail with necessary sketches. | CO3 | A | 12 |
|  | b. | Antireflection coating are used to solve ghost images problem – Justify and explain the same. | CO3 | An | 8 |
|  |  |  |  |  |  |
| 7. | a. | Paraphrase the following in the case of anti-fog coating   1. Formation of fogging on plastic materials 2. Elements that lead to fogging on plastic products 3. Chemicals used for anti-fog coating | CO4 | U | 12 |
|  | b. | Brief about anti-scratch coating. | CO4 | A | 8 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Debate on mirror coating in sunglasses along with their benefits. | CO5 | U | 12 |
|  | b. | Recognize the number of layers involved in hard-multi coating and brief them. | CO5 | A | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Draft any two manufacturing methods of aspheric lenses with suitable diagrams. | CO6 | U | 12 |
|  | b. | Discuss the benefits of aspheric lenses. | CO6 | A | 8 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Define the properties and characteristics of the tinted and protective lenses |
| CO2 | Describe the different types of filters used in lenses with their merits |
| CO3 | Examine the reflected images and ghost images from the spectacle lenses |
| CO4 | Analyse the effect of anti-reflective, anti-fog and anti-scratch coatings on the lenses |
| CO5 | Appraise on the size, shape and mounting of the lenses |
| CO6 | Design and develop flawless, purpose solving spectacle lenses suitable for the patients |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 | 20 |  |  |  | 40 |
| CO2 |  | 20 | 32 |  |  |  | 52 |
| CO3 |  |  | 12 | 8 |  |  | 20 |
| CO4 |  | 12 | 8 |  |  |  | 20 |
| CO5 |  | 20 | 8 |  |  |  | 28 |
| CO6 |  | 12 | 8 |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2019** | **Duration** | **3hrs** |
| **Course Name** | **OCULAR DISEASES II** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the diabetic retinopathy, etiology, classification, grades, clinical symptoms and signs and management. | CO2 | U | 15 |
|  | b. | Explain the disease “Retinitis pigmentosa” with diagram. | CO2 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Give the schematic diagram of the structure of vitreous humour and explain its anatomical parts.   1. Anterior hyaloid membrane 2) Posterior hyaloid membrane 2. Cloquet’s canal 4) Vitreous base 3. Ora serrate 6) Wiger’s ligament 4. Bergers space | CO1 | An | 10 |
|  | b. | Describe the vitreous diseases, etiology, clinical features and its management. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Enumerate the information on the topic “CRVO”. | CO2 | An | 10 |
|  | b. | Explain in detail about BRVO. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give an account of Central serous retinopathy, etiology, classification, grades, clinical symptoms and signs and management. | CO3 | E | 15 |
|  | b. | Define retinal detachment and represent the types of retinal detachment. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 5. | a. | Sketch and explain the stages of Cortical cataract and nuclear cataract. | CO4 | R | 15 |
|  | b. | Demonstrate with diagram about morphological classification of cataract. | CO4 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain in detail about   1. Cataract 2. Types of cataract 3. Senile cataract 4. Congenital cataract 5. Etiology 6. Clinical symptoms 7. Treatment | CO5 | C | 10 |
|  | b. | Interpret and explain the management of cataract. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain visual pathway with diagram, visual pathway lesions and its scotoma. | CO5 | A | 10 |
|  | b. | Write in detail the optic neuropathy, etiology, classification, grades, clinical symptoms and signs and management. | CO5 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Paraphrase Ocular trauma, etiology, classification, clinical features and management and first aid of ocular emergency in detail. | CO4 | C | 10 |
|  | b. | Define blindness.  Explain   1. Categories of blindness according to WHO 2. Epidemiology of blindness 3. Avoidable blindness 4. Causes of blindness 5. Global initiatives for prevention of blindness | CO5 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Differentiate hard drusen’s and soft drusen’s. | CO6 | A | 5 |
|  | b. | Explain  1. ARMD  2. Classification of ARMD  3. WET ARMD  4. DRY ARMD  5. Clinical features  6. Management | CO6 | An | 15 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | List the abnormalities, trauma and inflammation related to vitreous body |
| CO2 | Discuss in detail about the retinal disorder and related diseases. |
| CO3 | Interpret on the background, defects and techniques involved in neuro-ophthalmology |
| CO4 | Illustrate clearly on the supranuclear control of eye movements. |
| CO5 | Appraise on the anatomy, pathophysiology and aging process. |
| CO6 | Analyze on the causes, therapy and drug related to ocular diseases. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 10 | 10 |  |  | 20 |
| CO2 | 5 | 15 | 10 | 10 |  |  | 40 |
| CO3 |  | 5 |  |  | 15 |  | 20 |
| CO4 | 15 | 5 |  | 10 |  | 10 | 40 |
| CO5 | 10 |  | 10 |  | 10 | 10 | 40 |
| CO6 |  |  | 5 | 15 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2020** | **Duration** | **3hrs** |
| **Course Name** | **VISUAL OPTICS II** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe Anisometropia in detail with relevant diagrams. | CO1 | R | 6 |
|  | b. | Explain the defect Anisekonia, etiology of anisekonia, clinical types, symptoms and treatment in detail with required diagram. | CO1 | A | 14 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compare and contrast astigmatism and its types. | CO1 | U | 6 |
|  | b. | Illustrate the clinical characteristics of amblyopia in detail. Also describe the prevention and treatment of amblyopia. | CO1 | An | 14 |
|  |  |  |  |  |  |
| 3. | a. | Describe the prerequisites in detail that are required to carry out the retinoscopy procedure. | CO2 | U | 6 |
|  | b. | Explain near point and far point of accommodation in detail. Discuss near point and far point of accommodation for the hyperopic and myopic eyes with diagrams. | CO2 | A | 14 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Differentiate the eye conditions based on axial versus refractive ametropia with required examples. | CO2 | U | 6 |
|  | b. | Define AC/A ratio in refractive conditions. Illustrate the two different  methods used to calculate AC/A ratio in detail with numerical examples. | CO2 | An | 14 |
|  |  |  |  |  |  |
| 5. | a. | Explain the two types of retinoscopes and its principles in detail. | CO3 | A | 6 |
|  | b. | Appraise the principle and working of a streak retinoscope in detail with necessary diagram. Correlate some of the advantages and disadv antages among other retinoscopes and its procedures. | CO3 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the prerequisites that are required to carry out the retinoscopy procedure. | CO3 | U | 6 |
|  | b. | Explain the procedure involved in retinoscopy while attending a patient. Also identify and discuss any 5 problems present in performing retinoscopy procedures in clinics. | CO3 | A | 14 |
|  |  |  |  |  |  |
| 7. | a. | Differentiate subjective and objective refraction methods in optometry with three examples for each method. | CO4 | A | 6 |
|  | b. | Demonstrate the astigmatic fan test and its procedures to find out the axis and magnitude of the error present in patients with relevant diagrams. | CO4 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Compare and contrast ocular and spectacle refraction in detail with examples | CO5 | U | 6 |
|  | b. | Appraise the concepts involved in Binocular refraction and its advantages over monocular refraction in brief. Illustrate how the monocular viewing under binocular conditions can be achieved using concept septum and fogging. | CO5 | An | 14 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Analyze spectacle magnification and relative spectacle magnification while correcting the refractive errors in patients. | CO6 | U | 5 |
|  | b. | Determine the vertex compensation power for the spectacle power of –6.2D spherical with 10mm farther than from the eye distance than it should be. | CO6 | E | 5 |
|  | b. | Examine vertex distance effects and its significance in vision correction. Also examine vertex compensation power and effective power in detail with appropriate examples. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the different types of defects associated with vision |
| CO2 | Recognize various refractive conditions and relate both accommodation and convergence |
| CO3 | Review on the methods and optimum conditions such as static and dynamic of retinoscopy |
| CO4 | Compare the objective and subjective refractive methods along with other methods for  astigmatism |
| CO5 | Interpret on the astigmatic test and difficulties in objective tests |
| CO6 | Analyze and correct the defects that are connected to the spectacles |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 6 | 6 | 14 | 14 |  |  | 40 |
| CO2 |  | 12 | 14 | 14 |  |  | 40 |
| CO3 |  | 6 | 20 | 14 |  |  | 40 |
| CO4 |  |  | 6 | 14 |  |  | 20 |
| CO5 |  | 6 |  | 14 |  |  | 20 |
| CO6 |  | 5 |  | 10 | 5 |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2021** | **Duration** | **3hrs** |
| **Course Name** | **OPTOMETRIC INSTRUMENTATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define simultan test and explain its procedure. | CO1 | R&U | 2+3 |
|  | b. | Explain the different parts and working of streak retinoscopy. | CO1 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the five different types of phenomena in recognising the presence of astigmatism using retinoscope. | CO1 | U | 10 |
|  | b. | List the different parts of phoropter and mention its uses. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Demonstrate the different methods of illumination used in slit lamp test. | CO2 | A | 15 |
|  | b. | Differentiate direct and indirect ophthalmoscope and mention its uses. | CO2 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Illustrate the measurement of spherical, cylindrical and sphero-cylindrical power measurements using lensometer with appropriate sketches. | CO2 | A | 15 |
|  | b. | List the merits and demerits of indirect and direct ophthalmoscopes. | CO2 | R | 5 |
|  |  |  |  |  |  |
| 5. | a. | Identify the classification of tonometry with suitable examples and differentiate applanation and indentation tonometry with a neat sketch. | CO3 | R&U | 4+6 |
|  | b. | Illustrate the principle and techniques used in fundus camera. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Identify the different colors used in fundus drawing to represent normal and abnormal retina, tissue and veins. | CO4 | R | 5 |
|  | b. | Discuss the Goldmann tonometry technique with a neat sketch, mention its advantages and explain the different source of errors. | CO3 | U | 15 |
|  |  |  |  |  |  |
| 7. | a. | Demonstrate the ‘A’ scan and ‘B’ scan in ophthalmic ultrasonography with a neat sketch. | CO5 | A | 12 |
|  | b. | Describe the working principle of ocular ultrasound and discuss its intimations with respect to various ocular disorders. | CO5 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the indications of an electrodiagnostic service. | CO5 | U | 6 |
|  | b. | Demonstrate the origin of VEP and list the basic functions of V1. | CO5 | U&R | 3+4 |
|  | c. | Describe ERG and sketch the different types of ERG responses. | CO5 | R+A | 2+5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain about FM 100 test. | CO6 | U | 6 |
|  | b. | Illustrate the Humphry visual field test procedure. | CO6 | A | 14 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the various topics related to refractive instruments |
| CO2 | Discuss about the design, features and advantages of ophthalmoscope and related devices |
| CO3 | Illustrate on the principles, types and uses of tonometer |
| CO4 | Interpret the techniques involved in fundus camera |
| CO5 | Utilize the orthoptic and ophthalmic instruments for ultrasonography and electro diagnostics |
| CO6 | Appraise on the results of various vision testing and screening devices |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 12 | 28 | - | - | - | - | 40 |
| CO2 | 5 | 5 | 30 | - | - | - | 40 |
| CO3 | 4 | 21 | - | - | - | - | 25 |
| CO4 | 5 | - | 10 | - | - | - | 15 |
| CO5 | 6 | 17 | 17 | - | - | - | 40 |
| CO6 | 6 | - | 14 | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2025** | **Duration** | **3hrs** |
| **Course Name** | **CLINICAL EXAMINATION OF VISUAL SYSTEM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give a detailed account on the visual acuity assessment of 0-1 year age group children. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Elucidate a proper ocular history taking birth history also into account. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 3. | a. | Elaborate on the slit lamp examination techniques with suitable diagram. | CO2 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Interpret on EOM and cover test procedure with neat diagram. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. | a. | Discuss the indirect ophthalmoscopy, instrumentation procedures and its interpretation. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Give a detailed explanation on goldmann applanation tonometer and its instrumentation procedures. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Describe the procedures involved in exophthalmometer. | CO4 | An | 15 |
|  | b. | Write short notes on 90 D fundus examination. | CO5 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain proptosis, its clinical features, diagnosis and treatment modalities. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Provide a detailed explanation on optic nerve visual field defects with neat diagram. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of ophthalmic subject, symptoms and testing in visual system. |
| CO2 | Examine various steps involved in Ophthalmic treatment |
| CO3 | Illustrate the different types of lens examination and diagnosis |
| CO4 | Describe Ophthalmoscopy and its different types of treatment methods. |
| CO5 | Appraise the concepts of Fundus and Lacrimal examinations |
| CO6 | Demonstrate the macular functioning and testing in ophthalmological examination |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 20 | - | 20 | - | - | 40 |
| CO2 | 20 | 20 | - | - | - | - | 40 |
| CO3 | 20 | 20 | - | - | - | - | 40 |
| CO4 | - | - | - | 15 | - | - | 15 |
| CO5 | - | 5 | 20 | - | - | - | 25 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2026** | **Duration** | **3hrs** |
| **Course Name** | **CLINICAL PSYCHOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Evaluate the scope of psychology across different settings and contexts. How does this scope vary and adapt to meet the needs and challenges of these diverse environments? | CO1 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the contributions of early psychologists and their significance in the development of psychology as a field of study. | CO1 | U | 20 |
| 3. | a. | Analyze the dynamic relationship between sensation, attention, and perception, and how these cognitive processes interact and mutually influence one another, facilitating our ability to effectively process the information in our surrounding environment. | CO2 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the principles of perception, and illustrate each principle with a relevant example. | CO2 | U | 20 |
| 5. | a. | Define the concept of intelligence. Describe the different types or components of intelligence that have been proposed in psychological theories. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Compare and contrast various approaches to understand personality and critically assess the extent to which personality traits are considered permanent across these different theoretical perspectives. | CO3 | An | 20 |
| 7. | a. | Analyze the stages of grief that Michael, a 45-year-old man recently diagnosed with an irreversible eye condition leading to blindness, may go through as he copes with the emotional impact of his diagnosis. | CO5 | An | 20 |
|  |  | (OR) |  |  |  |
| 8. | a. | Develop a comprehensive plan outlining the various steps an ophthalmologist can take to assist a client in adapting to the challenging situation of losing sight. Consider the emotional and practical aspects of this transition, providing a well-structured strategy to support the client effectively. | CO6 | C | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the significance of the counselor-counselee relationship within a specific therapy approach and how this relationship contributes to the effectiveness of the therapeutic process. | CO4 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of clinical psychology and its various methods. |
| CO2 | Analyse the various steps involved in sensation process and determinants. |
| CO3 | Illustrate the factors involved in human psychology and personality integration. |
| CO4 | Appraise various steps in counselling. |
| CO5 | Describe the types of psychological reactions in patients with disability. |
| CO6 | Identify the disability and to allow the patients through rehabilitation process |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  | 20 |  | 40 |
| CO2 |  | 20 |  | 20 |  |  | 40 |
| CO3 |  | 20 |  | 20 |  |  | 40 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  |  |  |  |  | 20 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2027** | **Duration** | **3hrs** |
| **Course Name** | **LOW VISION AIDS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Tabulate the categories of low vision and discuss. | CO1 | U | 10 |
|  | b. | List and explain the types of magnification with proper examples. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the evaluation of low vision patients. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the different ways for distance vision assessment with necessary charts. | CO2 | R | 14 |
|  | b. | Write notes on the JND or Bracketing technique. | CO2 | U | 6 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give an account on contrast sensitivity and draw necessary charts that are used to assess it. | CO2 | An | 10 |
|  | b. | Elucidate on the colour vision assessment in low vision patients. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Mention the guidelines to determine magnification and discuss with two examples. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe non-optical aids with necessary diagrams. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain the procedure of light and glare management in low vision patient. | CO4 | U | 10 |
|  | b. | Discuss the automatic focus telescope and its specifications. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss any five pathological conditions with proper management plan in low vision clinic. | CO5 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Elaborate the rehabilitation process related to low vision patient. | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the diagnostic procedures in low vision patients and case management |
| CO2 | Analyze the evaluation techniques and demonstrating aids in low vision diagnosis |
| CO3 | Illustrate the need for taking care of the patients with teaching and guidance |
| CO4 | Demonstrate the use of telescopes and microscopes in low vision tests. |
| CO5 | Describe the pathological conditions and to administer the patients with low vision care. |
| CO6 | Identify the right optical devices for the rehabilitation of the visually handicapped |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | - | 20 | - | - | 40 |
| CO2 | 14 | 6 | 10 | 10 | - | - | 40 |
| CO3 | 20 | 20 | - | - | - | - | 40 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | - | 20 | - | - | - | 20 |
| CO6 | - |  | - | 20 | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2028** | **Duration** | **3hrs** |
| **Course Name** | **DISPENSING OPTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the most desirable properties of a material used for the manufacture and production of a spectacle frame. | CO1 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe on the measurement of Distance between Lenses (DBL), Effective Diameter (ED) and Geometric Centre Distance (GCD). | CO1 | A | 10 |
|  | b. | Analyze the five different types of temple parts and its uses. | CO1 | E | 10 |
|  |  |  |  |  |  |
| 3. | a. | Enumerate the seven types of OFF-FACE alignment of spectacles. | CO2 | C | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write notes on seven types of ON-FACE alignment of spectacles. | CO2 | An | 20 |
|  |  |  |  |  |  |
| 5. | a. | Discuss the fitting philosophies of Progressive Addition Lenses (PAL). | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write more information about the American National Standards Institute (ANSI). | CO3 | E | 20 |
|  |  |  |  |  |  |
| 7. | a. | What are the different methods to measure IPD? Explain the instrument and procedures of IPD measurement. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the instrumentation and procedure of distometer. | CO5 | An | 10 |
|  | b. | Discuss the ABBE value and the relationship of chromatic aberration of an ophthalmic lens material. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Elaborate the Special purpose frames. | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the ophthalmic materials in dispensing optics and its verification. |
| CO2 | Explain the special practices in handling the lenses and frames. |
| CO3 | Illustrate the procedures and process involved in the manufacturing of lenses. |
| CO4 | Demonstrate the use of dispensing instruments in lens measurements and frame fittings. |
| CO5 | Analyze various factors involved in the instrumentation for the selection of lenses. |
| CO6 | Identify and select the right frame designs and fittings for the patients. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 10 | 20 | 10 |  | 40 |
| CO2 |  |  |  | 20 |  | 20 | 40 |
| CO3 | 20 |  |  |  | 20 |  | 40 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 |  |  | 10 | 10 |  |  | 20 |
| CO6 |  |  |  | 20 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2029** | **Duration** | **3hrs** |
| **Course Name** | **BINOCULAR VISION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the procedures to find fusion, ARC, diplopia and suppression. | CO1 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the advantages and disadvantages of having two eyes in the different perspective. | CO1 | A | 20 |
|  |  |  |  |  |  |
| 3. | a. | Explain the achievement of Binocular vision by five neurovisual systems originating in the retina. | CO2 | E | 14 |
|  | b. | Define Stereopsis and name the charts used for it. | CO2 | C | 6 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the monocular cues giving the ability to measure how far away something is using proper examples. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 5. | a. | Give an account of Intermittent divergent exotropia, clinical features, types and management. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write a detailed investigation on third nerve palsy, clinical features, and diagnosis and treatment options. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. | a. | With an example elaborate Park three step test. | CO5 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss on the topics amblyopia, clinical features, diagnosis criteria and treatment modalities. | CO5 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain nystagmus, types, clinical features, diagnosis, and treatment options. | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the evolution of binocular vision and its different parameters. |
| CO2 | Explain the development of binocular vision and its neural aspects. |
| CO3 | Illustrate the visually guided behavior in the diagnosis of binocular vision and its AV phenomena. |
| CO4 | Demonstrate the various treatment and analysis of amblyopia in binocular vision. |
| CO5 | Analyze varioius types of strabismus and non-surgical management in binocular vision. |
| CO6 | Identify the orthoptic procedures involved in the treatment of binocular vision |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 20 | 20 |  |  | 40 |
| CO2 |  |  | 20 |  | 14 | 6 | 40 |
| CO3 |  |  |  | 20 |  |  | 20 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 | 20 | 20 |  |  |  |  | 40 |
| CO6 |  |  |  | 20 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2032** | **Duration** | **3hrs** |
| **Course Name** | **GLAUCOMA** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe ISNT RULE of optic rim with diagram. | CO1 | R | 5 |
|  | b. | Explain glaucomatous optic nerve appearance and optic nerve imaging. | CO1 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the surgical management of open angle glaucoma and laser procedure. | CO1 | U | 10 |
|  | b. | Explain the medical management of open angle glaucoma. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the surgical management of angle closure glaucoma and laser procedure. | CO2 | U | 10 |
|  | b. | Explain the medical management of angle closure glaucoma. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Differentiate between pachymetry and IOP. | CO2 | An | 5 |
|  | b. | Write a note on direct and indirect gonioscopy and explain about  commonly used gonioscopy lens. | CO2 | A | 15 |
|  |  |  |  |  |  |
| 5. | a. | Briefly explain angle closure glaucoma with pupillary block and explain its types, clinical features, and management. | CO3 | U | 15 |
|  | b. | Define Van Herrick grading | CO3 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Illustrate cup to disc ratio with diagram   1. Normal CD ratio 2. Large cup disc ratio | CO3 | A | 5 |
|  | b. | Explain in detail about various grading system of anterior chamber angle. | CO3 | U | 15 |
|  |  |  |  |  |  |
| 7. | a. | Discuss open angle glaucoma and explain its types, clinical features and management. | CO4 | U | 15 |
|  | b. | Explain pseudo exfoliation syndrome. | CO4 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain optical coherence tomography and glaucoma relation with diagram. | CO4 | U | 15 |
|  | b. | Name the tonometer’s for IOP Measurement | CO4 | R | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain automated perimetry and its interpretation. | CO5 | U | 15 |
|  | b. | Draw scotomas of various eye conditions. | CO6 | A | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basics of glaucoma |
| CO2 | Attain clear knowledge on the clinical examination of glaucoma. |
| CO3 | Interpret and diagnosis the different types of glaucoma. |
| CO4 | Articulate the medical characterisation of angle closure glaucoma. |
| CO5 | Detect developmental abnormality of angle of anterior chamber leading to high intraocular pressure. |
| CO6 | Adapt the proper medical treatment to normalize and control the intraocular pressure and to prevent loss of visual acuity. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 35 |  |  |  |  | 40 |
| CO2 |  | 20 | 15 | 5 |  |  | 40 |
| CO3 | 5 | 30 | 5 |  |  |  | 40 |
| CO4 | 5 | 35 |  |  |  |  | 40 |
| CO5 |  | 15 |  |  |  |  | 15 |
| CO6 |  |  | 5 |  |  |  | 5 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2033** | **Duration** | **3hrs** |
| **Course Name** | **PEDIATRIC OPTOMETRY AND GERIATRIC OPTOMETRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the ocular embryology in detail. | CO2 | U | 15 |
|  | b. | Describe APGAR Score and its significance in optometry. | CO2 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe a baby's visual development milestones. | CO1 | U | 10 |
|  | b. | Illustrate the details on post-natal factors of neonates. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write detailed notes on VA assessment in school going children. | CO4 | R | 10 |
|  | b. | Discuss the procedures of cover test. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain krimsky and modified krimsky test. | CO4 | U | 10 |
|  | b. | Describe the ERG wave patterns. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain about myopia and its treatment. | CO4 | U | 15 |
|  | b. | Give notes on latent hyperopia. | CO3 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the accommodative esotropia and its types. | CO3 | R | 10 |
|  | b. | Give notes on clinical features of congenital esotropia. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Briefly explain about brunescent cataract. | CO5 | U | 5 |
|  | b. | Describe the different types and available treatments for macular hole. | CO5 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain secondary open angle glaucoma, pathophysiology, clinical features and treatments options. | CO5 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the optometric examinations of older adults in detail. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the principal theories of childhood and visual development. |
| CO2 | Analyse a thorough pediatric history which encompasses the relevant developmental, visual, medical and educational issues. |
| CO3 | Attain clear knowledge on the accommodative-vergence system to assess the pediatric eye disorders. |
| CO4 | Analyse the techniques for examining visual function of children of all ages and an understanding varied management concepts of pediatric vision disorders. |
| CO5 | Identify and investigate the age related changes in the eyes. |
| CO6 | Demonstrate dispensing contact lens, low vision aids and referral to the surgeon. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | - | - | - | - | 20 |
| CO2 | - | 20 | - | - | - | - | 20 |
| CO3 | 10 | 25 | - | - | - | - | 35 |
| CO4 | 10 | 35 | - | - | - | - | 45 |
| CO5 | - | 40 | - | - | - | - | 40 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2034** | **Duration** | **3hrs** |
| **Course Name** | **CONTACT LENS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss in brief about slit lamp biomicroscopy illumination techniques. | CO6 | U | 10 |
|  | b. | Explain the optics of contact lens materials with neat diagram. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss in detail about contact lens materials. | CO1 | U | 14 |
|  | b. | Describe contact lens materials in vivo measurements. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 3. | a. | Give a note on the Bausch and Lomb keratometer with neat diagram. | CO6 | R | 14 |
|  | b. | Write a summary on the contact lens solution. | CO3 | R | 6 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | List out the indications and contra-indications of contact lenses. | CO2 | R | 15 |
|  | b. | Distinguish between oxygen permeability and oxygen transmissibility. | CO2 | An | 5 |
|  |  |  |  |  |  |
| 5. | a. | Describe the contact lens fitting procedures for keratoconus. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write the fitting techniques of contact lens in aphakia. | CO4 | R | 10 |
|  | b. | Discuss the advantages and disadvantages of high Dk contact lens materials. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain therapeutic contact lens and its indications. | CO4 | U | 10 |
|  | b. | Write the fitting techniques of contact lens in children. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Differentiate between continuous wear and extended wear contact lenses. | CO3 | An | 10 |
|  | b. | Give a note on optics of bifocal contact lens. | CO4 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | How do you instruct wearers about CL care and maintenance? Explain. | CO5 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the history and basics of contact lenses. |
| CO2 | List the important properties of contact lenses. |
| CO3 | Predict the contact lens design for various kinds of patients. |
| CO4 | Recognize various type of contact lens fitting |
| CO5 | Hypothesize the contact lens care procedures for the awareness of the patients |
| CO6 | Demonstrate the instrumentation in contact lens practices. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 14 | - | - | - | - | 14 |
| CO2 | 15 | 26 | - | 5 | - | - | 46 |
| CO3 | 6 | - | - | 10 | - | - | 16 |
| CO4 | 30 | 30 | - | - | - | - | 60 |
| CO5 | - | - | 20 | - | - | - | 20 |
| CO6 | 14 | 10 | - | - | - | - | 24 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2035** | **Duration** | **3hrs** |
| **Course Name** | **OCCUPATIONAL OPTOMETRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain any five objectives of ILO on occupational health. | CO1 | U | 10 |
|  | b. | Explain any five aims of WHO on occupational health. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss any five aims of Labour law. | CO1 | U | 10 |
|  | b. | Write notes on Occupational safety. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Define Factories act and rules (any five) in detail. | CO2 | R | 10 |
|  | b. | Define how the ESI act helps employees. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write detailed notes on Occupational diseases caused by physical agents. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 5. | a. | List the Light measurements and standards in table. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the Colour Vision and test types in detail. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain the lasers used in ophthalmology and their hazards on the eye. | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain in detail Visual task analysis steps. | CO4 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write detailed notes on PPE. | CO5 | U | 10 |
|  | b. | List the visual standards for loco pilots. | CO6 | R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the occupational health |
| CO2 | Identify the visual requirements in various jobs. |
| CO3 | Illustrate the effects of Physical, chemical and biological hazards on eye and vision |
| CO4 | Analyze occupational causes of visual and eye problems. |
| CO5 | Prescribe suitable corrective lenses and eye protective wear to the patients. |
| CO6 | Formulate visual requirements and standards for different jobs. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 30 | 10 |  |  |  | 40 |
| CO2 | 20 |  | 20 |  |  |  | 40 |
| CO3 | 20 | 20 |  |  |  |  | 40 |
| CO4 |  | 40 |  |  |  |  | 40 |
| CO5 |  | 10 |  |  |  |  | 10 |
| CO6 | 10 |  |  |  |  |  | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20OP2036** | **Duration** | **3hrs** |
| **Course Name** | **SYSTEMATIC DISEASES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain hyper and hypo thyroidism. | CO1 | U | 10 |
|  | b. | What is thyroid orbitopathy? | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe hypertension, clinical features and its management. | CO1 | R | 10 |
|  | b. | Explain the stages of hypertensive retinopathy. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Summarize about acquired heart disease. | CO2 | E | 10 |
|  | b. | Evaluate retinal vein occlusion clinical features and its management. | CO2 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write a note on Nutritional Deficiency. | CO2 | U | 10 |
|  | b. | Explain about Vitamin A deficiency disorders of eye. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain diabetes mellitus, clinical features and its management. | CO4 | U | 10 |
|  | b. | Describe the stages of diabetic retinopathy. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss on cancer, the types, stages and its management. | CO4 | A | 10 |
|  | b. | Explain the tumors in eye. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | What is the mode of transmission of tuberculosis? Explain the clinical features and management of tuberculosis. | CO3 | R | 10 |
|  | b. | Discuss about uveitis caused by tuberculosis. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss the different forms of arthritis. | CO6 | An | 10 |
|  | b. | Explain about episcleritis and scleritis. | CO5 | E | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a note on stroke. | CO5 | A | 10 |
|  | b. | Explain in detail about associated eye disorder of stroke.   1. Optic disc 2. Retina 3. Visual pathway | CO5 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the common systematic conditions. |
| CO2 | Classify the various systematic diseases and the respective clinical examinations. |
| CO3 | Perform the clinical diagnosis of diverse systematic diseases. |
| CO4 | Acquaint with the first aid knowledge and management options |
| CO5 | Analyse the Ocular findings of the systematic conditions. |
| CO6 | Design the report on malnutrition and immunology. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 20 |  |  |  |  | 40 |
| CO2 | 10 | 10 |  |  | 20 |  | 40 |
| CO3 | 20 | 10 |  |  |  |  | 30 |
| CO4 |  | 10 | 20 |  |  |  | 30 |
| CO5 | 10 |  | 10 |  | 10 |  | 30 |
| CO6 |  |  |  | 10 |  |  | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20PH1001** | **Duration** | **3hrs** |
| **Course Name** | **ELEMENTS OF PHYSICS IN AVIATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | **CO/BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | What is reflection and refraction? | CO1/U | 1 |
| 2. | What type of image is produced by a mirror? | CO1/U | 1 |
| 3. | When does oscillations occur? | CO2/U | 1 |
| 4. | For a simple pendulum time period depends upon \_\_\_\_\_\_\_\_. | CO2/U | 1 |
| 5. | What are cathode rays? | CO3/U | 1 |
| 6. | What is work function? | CO3/U | 1 |
| 7. | Which Kepler’s law states that square of the time period is proportional to cube of semi-major axis? | CO4/U | 1 |
| 8. | What is the shape of the orbit of planets and where is the sun located in these orbits? | CO4/U | 1 |
| 9. | Define sound intensity. | CO5/U | 1 |
| 10. | What relates change in volume and pressure? | CO5/U | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | What is diffraction? Explain with a sketch Fresnel’s diffraction. | CO1/U | 3 |
| 12. | If is wave equation, find ratio of second derivative (partial) of “*y*” w.r.t “*t*” and “*x*”. | CO2/U | 3 |
| 13. | With a neat sketch explain the experimental arrangement of photo electric effect. | CO3/U | 3 |
| 14. | Bulk modulus is defined as ; where “*p*” is pressure and “*V*”is volume. Say, an acoustic wave of the form is travelling in a certain medium. Prove that *Pmax* = *BkA*. | CO5/U | 3 |
| 15. | State all the Kepler’s laws. | CO4/U | 3 |
| 16. | When do you call something as nano material? Name some products where they are found. | CO6/U | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23. Q.No 24 is Compulsory)** | | | | |
| 17. | a. | Obtain Image and object relation for a concave spherical mirror. | CO1/U | 4 |
| b. | State Fermat’s principle and show that angle of incidence is equal to angle of reflection. | CO1/U | 4 |
|  | c | From Fermat’s principle obtain Snell’s law. | CO1/A | 4 |
|  |  |  |  |  |
| 18. | a. | For a simple pendulum show that . | CO2/A | 5 |
| b. | For the above problem 18 (a) give your reasons why simple pendulum can be used to keep time and what happens if the same pendulum is carried to moon. | CO2/U | 7 |
|  |  |  |  |  |
| 19. | a. | Prove that a body undergoing simple harmonic motion will have total energy *E* = ½ *kA*2 at any given instant. Hint: displacement is given by *x* = *A* cos (ωt+φ). | CO2/A | 6 |
|  | b | Define standing wave. What is constructive and destructive interference and obtain location of nodes. | CO2/A | 6 |
|  |  |  |  |  |
| 20. | a. | With a neat sketch explain the working of Scanning Electron Microscope. | CO3/U | 6 |
| b. | In Photo Electric Effect experiment, what happens when potential difference, frequency and intensity are increased? | CO3/U | 6 |
|  |  |  |  |  |
| 21. | a. | What is a space probe? Write about a space probe that you know. | CO4/U | 7 |
| b. | What are space debris? Write a note on handling space debris. | CO4/U | 5 |
|  |  |  |  |  |
| 22. | a. | With the help of neat sketch explain Kundt’s tube. | CO5/A | 6 |
| b. | Explain what is Doppler effect? | CO5/U | 6 |
|  |  |  |  |  |
| 23. | a. | With a neat sketch explain various location of a spring mass system oscillation on a horizontal frictionless guide. | CO1/U | 5 |
| b. | Prove that an object undergoing SHM is indeed a projection of a particle on to the diameter (the particle is moving along a circle) and show that . | CO1/A | 7 |
|  |  | **Compulsory:** | | |
| 24. | a. | Explain a mechanical process to obtain nano material. | CO6/U | 6 |
| b. | Explain sol-gel procedure of synthesizing nano materials. | CO6/U | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | Compare the laws of optics with regards to reflection, refraction, interference, diffraction and polarization. |
| CO2 | Explain various laws governing oscillations and waves. |
| CO3 | Compare the ability of analytical instruments. |
| CO4 | Describe the interplanetary travel in solar system. |
| CO5 | Describe the characteristics of acoustic waves. |
| CO6 | Explain the process of obtaining nanomaterial and its applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 18 | 11 |  | - | - | 29 |
| CO2 |  | 12 | 17 |  |  |  | 29 |
| CO3 |  | 17 | 0 | 0 | - | - | 17 |
| CO4 |  | 17 |  |  |  |  | 17 |
| CO5 |  | 11 | 06 |  | - | - | 17 |
| CO6 |  | 15 |  |  | - | - | 15 |
|  | | | | | | | 124 |



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| **Course Code** | **20PH1011** | **Duration** | **3hrs** |
| **Course Name** | **PHYSICAL ELECTRONICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Sketch the energy band diagram of an insulator. | | CO1 | A | 1 |
| 2. | State the formula to represent the mobility of an electron. | | CO1 | R | 1 |
| 3. | List any two field effect transistors. | | CO2 | R | 1 |
| 4. | Identify a trivalent dopant which is added to a pure semiconductor to get P-type semiconductor | | CO2 | U | 1 |
| 5. | ----------- is the process of adding impurities to intrinsic semiconductors. | | CO3 | R | 1 |
| 6. | If a monochromatic light is made to pass through the liquid at right angle to the direction of propagation of ultrasonic waves, the liquid then behaves like a \_\_\_\_\_\_\_\_\_\_ grating. | | CO3 | R | 1 |
| 7. | State the abbreviation of SONAR? | | CO4 | R | 1 |
| 8. | Interpret the principle behind the ultrasonic flaw detector. | | CO4 | U | 1 |
| 9. | Infer the frequency range of ultrasound waves. | | CO5 | U | 1 |
| 10. | List any two non-conventional sources of energy. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Compare Zener Breakdown with Avalanche Breakdown. | | CO1 | An | 3 |
| 12. | Write any three applications of PN junction diode. | | CO2 | A | 3 |
| 13. | Ultrasonics interferometer-based system is used to measure the velocity of ultrasonic waves in the sea. The distance between the two anti-nodes is found to be 0. 4mm.Calculate the velocity of the waves in the sea water. Frequency of the wave generated by the crystal is 1.5MHz. | | CO3 | A | 3 |
| 14. | Interpret the characteristics of musical sound. | | CO4 | A | 3 |
| 15. | Describe the basic principle of acoustic grating. | | CO5 | U | 3 |
| 16. | Categorize the various types of wave energy. | | CO6 | An | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Elaborate the direct and Indirect band gap semiconductors. Also explain about the E-k Diagram. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 18. | a. | Sketch the Schottky Diode and explain its operation. | CO2 | A | 8 |
|  | b. | Distinguish between Homo and Hetero junction semiconductors. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. | a. | Classify the types of MOSFET and discuss the operation of P-channel Depletion MOSFET. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. | a. | Describe the factors that affect the acoustics of building and provide their remedies in detail. | CO4 | R | 12 |
|  |  |  |  |  |  |
| 21. | a. | Explain the applications of Non-Destructive Testing of Materials with ultrasonics. Also, Compare the destructive and non-destructive testing. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Illustrate the classification of Sound in acoustic | CO4 | A | 6 |
|  | b. | Determine the Characteristics of Musical Sound in acoustics. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Describe the formation of PN junction and illustrate the movement of charges in forward bias and reverse bias conditions. | CO2 | R | 8 |
|  | b. | Explain de Broglie wave Equation. | CO2 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | State the photovoltaic effect. | CO6 | U | 2 |
|  | b. | Explain the construction and working of a photovoltaic cell with necessary diagram. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Remember the fundamentals of semiconducting physics. |
| CO2 | Understand the principle and operation of semiconductor junctions. |
| CO3 | Demonstrate the MOS structures. |
| CO4 | Analyze the application of acoustics in construction and acoustic design. |
| CO5 | Ability to explore the application of ultrasonics in various fields. |
| CO6 | Understand about the renewable energy sources and devices. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 13 | - | 1 | 3 | - | - | 17 |
| CO2 | 9 | 5 | 15 | - | - | - | 29 |
| CO3 | 2 | - | 3 | 12 | - | - | 17 |
| CO4 | 13 | 1 | 15 | - | - | - | 29 |
| CO5 | - | 4 | - | 12 | - | - | 16 |
| CO6 | 1 | 2 | - | 13 | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **20PH1015** | **Duration** | **3hrs** |
| **Course Name** | **PHYSICS FOR ROBOTICS ENGINEERS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | The \_\_\_\_\_\_\_ experienced by the object equals change in momentum. | | CO1 | U | 1 |
| 2. | If we know how the potential energy varies with position, we can find the conservative \_\_\_\_\_ as a function of position. | | CO1 | R | 1 |
| 3. | \_\_\_\_\_\_\_ stress is also known as tangential stress. | | CO2 | U | 1 |
| 4. | The \_\_\_\_\_\_\_\_ law states that within the elastic limit, stress is directly proportional to strain. | | CO2 | R | 1 |
| 5. | Give the expression relating the angular momentum and torque acting on a particle. | | CO3 | A | 1 |
| 6. | \_\_\_\_\_\_ is the best example for a simple harmonic motion. | | CO4 | R | 1 |
| 7. | Expand LASER. | | CO5 | R | 1 |
| 8. | Mention any one example for a solid type laser. | | CO5 | R | 1 |
| 9. | \_\_\_\_ cables have replaced copper cables for communication purposes. | | CO6 | A | 1 |
| 10. | The broadening of light pulse due to long transmission in a fiber cable is called \_\_\_\_\_\_. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | A 76 Kg boater, initially at rest in a stationary 45 Kg boat, steps out of the boat onto the dock. If the boater moves with a velocity of 2.5 m/s to the right, what is the final velocity of the boat? | | CO1 | A | 3 |
| 12. | Briefly write about shear stress. | | CO2 | R | 3 |
| 13. | Find the expression for the angular momentum of a rotating rigid body. | | CO3 | A | 3 |
| 14. | Obtain the total energy of a body in simple harmonic motion. | | CO4 | A | 3 |
| 15. | Write short notes on stimulated emission. | | CO5 | U | 3 |
| 16. | Discuss in short about bending loss. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Derive the three Newton’s equations of motion for uniform acceleration. | CO1 | A | 10 |
|  | b. | A bus starts from rest and moves with a constant acceleration of 8ms−2. At the same time, a car travelling with a constant velocity of 16 m/s overtakes and passes the bus. After how much time and at what distance, the bus overtakes the car? | CO1 | An | 2 |
|  |  |  |  |  |  |
| 18. | a. | State Hooke’s law. Discuss the three types of elastic constants in detail. | CO2 | R | 10 |
|  | b. | Define Poisson’s ratio with necessary formula. | CO2 | R | 2 |
|  |  |  |  |  |  |
| 19. | a. | Write short notes on damping oscillation. Explain their types with necessary diagram. | CO4 | U | 10 |
|  | b. | Illustrate a simple pendulum with neat diagram. | CO4 | U | 2 |
|  |  |  |  |  |  |
| 20. |  | Write the features of the He-Ne laser system with respect to the following:  (i) Construction (ii) Energy level diagram. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 21. | a. | With necessary diagram, discuss how laser is used in the production and reconstruction of a hologram. | CO5 | An | 10 |
|  | b. | Draw the energy level diagram involved for the production of Nd-YAG laser. | CO5 | U | 2 |
|  |  |  |  |  |  |
| 22. |  | What are the factors that lead to the loss in signal in an optical fibre cable? Discuss with necessary diagrams. | CO6 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Classify optical fiber cable based on the following:   1. Materials used 2. Mode of propagation | CO6 | An | 10 |
|  | b. | Draw the block diagram of the optical fiber communication system. | CO6 | R | 2 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Give a detailed report on rigid body and its motion with examples. | CO3 | A | 10 |
|  | b. | State Euler’s second law. | CO3 | U | 2 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | | **COURSE OUTCOMES** | | | | | | | |
| CO1 | | Apply Newtonian Mechanics to solve problems. | | | | | | | |
| CO2 | | Demonstrate the ability to solve the problems based on the modulus of elasticity. | | | | | | | |
| CO3 | | Analyze rigid body mechanics using transformations. | | | | | | | |
| CO4 | | Apply the fundamentals laws concerning Oscillations. | | | | | | | |
| CO5 | | Discuss the concepts of lasers and their applications. | | | | | | | |
| CO6 | | Relate the application of fiber optics in optic devices | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | | |
| **CO / P** | | **R** | **U** | **A** | **An** | **E** | **C** | **Total** | |
| CO1 | | 1 | 1 | 13 | 2 | - | - | 17 | |
| CO2 | | 16 | 1 | - | - | - | - | 17 | |
| CO3 | | - | 2 | 14 | - | - | - | 16 | |
| CO4 | | 1 | 12 | 3 |  | - | - | 16 | |
| CO5 | | 2 | 17 |  | 10 | - | - | 29 | |
| CO6 | | 5 | 1 | 1 | 22 | - | - | 29 | |
|  | | | | | | | | **124** | |



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| **Course Code** | **20PH1017** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED PHYSICS FOR BIOTECHNOLOGY ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | | List out the properties of laser and define the term monochromatic. | | CO1 | R | 1 |
| 2. | | \_\_\_\_\_\_\_\_\_ is the Principle of laser. | | CO1 | U | 1 |
| 3. | | The fundamental principle of operation of an optical fiber cable is \_.   1. Total Internal Refraction 2. Total Internal Diffraction 3. Total Internal Interference 4. Total Internal Reflection | | CO2 | R | 1 |
| 4. | | This light ray would never cross and intersect the axis of the optical fiber cable. This light ray is known as \_\_\_\_\_. | | CO2 | U | 1 |
| 5. | | Based on frequency, sound waves are classified into three types:-   1. Infra sound, Audible sound, Ultrasound 2. Infrared, Audible sound, Ultraviolet 3. Infra sound, Audible sound, Ultraviolet 4. Infrared, Audible sound, Ultrasound | | CO3 | R | 1 |
| 6. | | Name the scientist who invented the Magnetostriction effect. | | CO3 | U | 1 |
| 7. | | Find out the correct statement about the nature of sound waves from the given statements.   1. Sound is a longitudinal and mechanical wave. 2. Sound is a transverse and mechanical wave. 3. Sound is a longitudinal and electromagnetic wave. 4. Sound is a transverse and electromagnetic wave. | | CO4 | R | 1 |
| 8. | | Define reverberation time. | | CO4 | U | 1 |
| 9. | | \_\_\_\_\_\_\_\_\_is the magnetism retained even after the applied external field is removed from a ferro magnetic material. | | CO5 | R | 1 |
| 10. | | The materials with narrow hysteresis loops are classified as \_\_\_\_\_\_\_\_. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | | What is spontaneous emission? Give example. | | CO1 | U | 3 |
| 12. | | Define total internal reflection. | | CO2 | A | 3 |
| 13. | | State piezoelectric effect. | | CO3 | U | 3 |
| 14. | | Describe the Rayleigh waves or surface waves. | | CO4 | A | 3 |
| 15. | | What are soft and hard magnetic materials? | | CO5 | U | 3 |
| 16. | | Superconducting Niobium titanate (NbTi) has a critical temperature of 10 K. Its critical field at 0 K is 15 Tesla. Find the critical field at 5 K. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | | |
| 17. | a. | | Deduce the Einstein’s quantum theory of radiation to establish the existence of stimulated emission of radiation. | CO1 | A | 12 |
|  |  | |  |  |  |  |
| 18. | a. | | Classify the optical fiber cables based on Refractive index profile and propagation. | CO2 | An | 12 |
|  |  | |  |  |  |  |
| 19. | a. | | Demonstrate the methods of producing ultrasonic waves using magnetostrsiction and piezo electric methods. | CO3 | A | 12 |
|  |  | |  |  |  |  |
| 20. | a. | | Analyze any four factors that affect the acoustics of a good auditorium and suggest remedial measures for the same. | CO4 | An | 12 |
|  |  | |  |  |  |  |
| 21. | a. | | Analyse the different magnetic materials with suitable schematic diagrams. | CO5 | An | 12 |
|  |  | |  |  |  |  |
| 22. | a. | | Demonstrate the method of population inversion to achieve lasting action. | CO1 | R | 6 |
|  | b. | | Derive the Acceptance angle and Numerical aperture and the relation connecting both. | CO2 | R | 6 |
|  |  | |  |  |  |  |
| 23. | a. | | Discuss the production of ultrasonic wave by piezoelectric effect. | CO3 | U | 8 |
|  | b. | | List out the characteristics of a musical sound with a description for each. | CO4 | U | 4 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | | Differentiate the Type I and Type II Super conductors with a table and suitable diagram. | CO6 | R | 12 |

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concept of lasers and apply laser action in food processing industries. |
| CO2 | Explain and interpret the principle of fiber optics for food quality and safety assessment. |
| CO3 | Apply non-destructive testing techniques in agro-food products. |
| CO4 | Discern the laws governing acoustics and implement the same in creating better environment for workers in food industries. |
| CO5 | Evaluate and perceive various laws governing magnetism with special reference to magnetic separation of contaminants in food industries. |
| CO6 | Create efficient industrial applications by applying the principles of superconducting materials. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 7 | 4 | 12 | --- | --- | --- | **23** |
| CO2 | 7 | 1 | 3 | 12 | --- | --- | **23** |
| CO3 | 1 | 12 | 12 | --- | --- | --- | **25** |
| CO4 | 1 | 5 | 3 | 12 | --- | --- | **21** |
| CO5 | 1 | 4 | --- | 12 | --- | --- | **17** |
| CO6 | 12 | --- | 3 | --- | --- | --- | **15** |
| Sub-Total | 29 | 26 | 33 | 36 | --- | --- | **---** |
| **Grand Total** | | | | | | | **124** |



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| **Course Code** | **20PH1018** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED PHYSICS FOR FOOD PROCESS OPERATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Write one of the advantages of laser packaging in food process industry. | | CO1 | R | 1 |
| 2. | Infer the disadvantages of traditional food cutting techniques. | | CO1 | U | 1 |
| 3. | List the two types of fiber optics biosensors. | | CO2 | R | 1 |
| 4. | Explain the principle of fiber optics biosensors briefly. | | CO2 | U | 1 |
| 5. | BLUEFIN 21 BPAUV is a device that uses ultrasound. Expand BPAUV. | | CO3 | R | 1 |
| 6. | Point out the advantages of ultrasound quality measurements in food processing industry. | | CO3 | U | 1 |
| 7. | Identify the quality of brittle materials that rapidly fracture under stress at small strains. | | CO4 | R | 1 |
| 8. | Mention the principle behind acoustical analysis of food items. | | CO4 | U | 1 |
| 9. | Detection and removal of metal contaminants is becoming common practice in the food processing industry. Identify the technique by which it is achieved. | | CO5 | R | 1 |
| 10. | List the various types of magnetic separators used in food process industry. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Calculate the wavelength of emission from a semiconductor laser when the band gap energy is 2 eV. | | CO1 | U | 3 |
| 12. | Compute the acceptance angle for the plastic optical fiber cable with a numerical aperture of 0.567. | | CO2 | A | 3 |
| 13. | Determine the fundamental frequency of a vibrating 2.5 mm long quartz crystal vibrating at resonance. [Young's Modulus (7.9 x 1010 N/m2) and ρ (2650 kg/m3)]. | | CO3 | U | 3 |
| 14. | Determine the intensity level of a thunderstorm, which is measured at 10 dB. [Provided:- standard intensity (10-12 W/m2)]. | | CO4 | A | 3 |
| 15. | Calculate the flux density of a paramagnetic material with a magnetic field intensity of 104 A m-1 and a magnetization intensity of 34 A m-1. | | CO5 | U | 3 |
| 16. | Determine the critical field of superconducting Niobium titanate (NbTi) at 5 K, given that its critical temperature is 10 K, and its critical field at 0 K is 15 Tesla. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Provide an illustration of the construction and operation of a carbon dioxide laser, accompanied by the essential energy level diagram. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Analyze optical fiber cables by categorizing them according to the materials used in their production and the modes of light transmission, providing a comprehensive explanation for each classification. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Elucidate the method of producing ultrasonic waves using the magnetostriction effect, with the incorporation of a circuit diagram. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | List four crucial factors that can impact the acoustics of an auditorium and explain them in detail and propose measures to enhance its acoustic qualities for optimal acoustical quality. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. | a. | Contrast the significant characteristics among dia, para, and ferromagnetic materials based on their response to an applied magnetic field. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Name the fundamental processes occurring within a laser and provide a concise definition of one of these processes. | CO1 | R | 6 |
|  | b. | Define numerical aperture and acceptance angle, including their respective equations and accompanying diagrams. | CO2 | R | 6 |
|  |  |  |  |  |  |
| 23. | a. | Provide a brief explanation of the physical phenomena of the piezoelectric effect and its inverse. | CO3 | U | 6 |
|  | b. | Name the characteristics of a musical sound and describe in brief, any one of them. | CO4 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Evaluate the characteristics of Type I and Type II superconductors in detail, accompanied by the necessary diagrams. | CO6 | E | 6 |
|  | b. | Analyze the behavior of normal conductors and superconductors when subjected to a high current. | CO6 | E | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand the concept of lasers and apply laser action in food processing industries. | | | | | | | |
| CO2 | Explain and interpret the principle of fiber optics for food quality and safety assessment. | | | | | | | |
| CO3 | Apply non-destructive testing techniques in agro-food products. | | | | | | | |
| CO4 | Discern the laws governing acoustics and implement the same in creating better environment for workers in food industries. | | | | | | | |
| CO5 | Evaluate and perceive various laws governing magnetism with special reference to magnetic separation of contaminants in food industries. | | | | | | | |
| CO6 | Create efficient industrial applications by applying the principles of superconducting materials. | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | |
| **CO / P** | | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | | 7 | 4 | 12 | --- | --- | --- | 23 |
| CO2 | | 7 | 1 | 3 | 12 | --- | --- | 23 |
| CO3 | | 1 | 10 | 12 | --- | --- | --- | 23 |
| CO4 | | 1 | 7 | 3 | 12 | --- | --- | 23 |
| CO5 | | 1 | 4 | --- | 12 | --- | --- | 17 |
| CO6 | | -- | --- | 3 | --- | 12 | --- | 15 |
| Sub-Total | | 17 | 26 | 33 | 36 | 12 | --- | --- |
| **Grand Total** | | | | | | | | **124** |



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| **Course Code** | **20PH1020** | **Duration** | **3hrs** |
| **Course Name** | **APPLICATION OF ENGINEERING MATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define space lattice. | | CO1 | R | 1 |
| 2. | Infer coordination number and atomic packing factor for BCC unit cell. | | CO1 | U | 1 |
| 3. | Infer Dislocation in materials. | | CO2 | A | 1 |
| 4. | ………………increase in the number of dislocations inducing large residual stresses. | | CO2 | U | 1 |
| 5. | Limit of proportionality depends upon \_\_\_\_\_\_\_\_\_\_\_\_. | | CO3 | An | 1 |
| 6. | …………….. is a good example of a natural composite, combination of cellulose fiber and lignin. | | CO3 | R | 1 |
| 7. | ……………….multiphase material with significant presence of each phase. | | CO4 | R | 1 |
| 8. | HSS are used in……………. | | CO4 | U | 1 |
| 9. | ……………. improves the strength and hardness of steel. | | CO5 | R | 1 |
| 10. | ……………………….. is the degeneration of materials by reaction with environment. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | What is allotropy? Give examples. | | CO1 | U | 3 |
| 12. | Draw stress strain curve for polymers. | | CO2 | An | 3 |
| 13. | Define toughness. | | CO3 | A | 3 |
| 14. | State few advantagess of composites. | | CO4 | A | 3 |
| 15. | Classify various steels with respect to their functions. | | CO5 | An | 3 |
| 16. | List a few factors leading to corrosion. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Compare and contrast F.C.C,B.C.C and H.C.P crystal systems. | CO1 | An | 6 |
|  | b. | List the 14 crystal systems with neat sketches. | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. | a. | Illustrate any two hardness testing procedures. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. | a. | With a neat sketch explain tensile testing and the results obtained. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Summarize the general characteristics of composite materials. | CO4 | An | 6 |
|  | b. | Enumerate the processing of metal matrix composites with neat sketches. | CO4 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Elaborate on the material selection process for bearing applications. | CO5 | U | 6 |
|  | b. | Illustrate the various parameters to be considered in tool selection process. | CO5 | A | 6 |
|  |  |  |  |  |  |
| 22. | a. | Appraise the plastic deformation by slip and twinning | CO2 | A | 6 |
|  | b. | Interpret point and surface defects in crystals. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 23. | a. | Analyze any one strengthening mechanism with neat sketches | CO 2 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |  |  |  | An |
| 24. | a. | Compare and contrast Wet and dry corrosion with suitable case studies. | CO6 | A | 6 |
|  | b. | Appraise any one method of protection from corrosion. | CO6 | An | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Apply the concepts of materials science for material selections towards new product development. |
| CO2 | Evaluate behavior of metal/alloys for engineering applications. |
| CO3 | Suggest the modern ceramic materials for engineering applications. |
| CO4 | Synthesize and develop the unique customized composites for aerospace applications. |
| CO5 | Knowledge on bearing, cutting and refractory metals for special engineering applications |
| CO6 | Develop the corrosion resistance materials for marine applications |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 11 | 1 | 8 |  |  | 20 |
| CO2 |  | 5 | 22 |  |  |  | 27 |
| CO3 |  | 4 | 14 | 10 |  |  | 28 |
| CO4 | 1 | 3 | 3 |  |  |  | 7 |
| CO5 | 1 |  | 15 | 12 |  |  | 28 |
| CO6 |  | 2 | 6 | 6 |  |  | 14 |
|  | | | | | | | **124** |



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| **Course Code** | **20PH3009** | **Duration** | **3hrs** |
| **Course Name** | **QUANTUM MECHANICS II** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | If the considered system interacts with an external agency, then there are transitions in the system with a definite transition rate from a fixed initial to a final state. Discuss the development of state for an isolated system which has a time independent Hamiltonian. | CO1 | U | 15 |
|  | b. | Deduce the transition probability per unit time for emission where perturbation term has the harmonic form. | CO1 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Let us consider a system wherein the perturbation is applied very slowly. Discuss the approximation that can be applied on such a system based on the time dependent perturbation theory. | CO1 | U | 15 |
|  | b. | Give an account on the Fermi-Golden rule. | CO1 | R | 5 |
|  |  |  |  |  |  |
| 3. | a. | The method of partial waves originally applied for scattering of sound and Schrodinger waves is mainly applicable to spherical symmetric potentials. Discuss in detail. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Apply Born approximation to obtain the first scattering amplitude and scattering cross-section and discuss the validity of scattering by a square well-potential. | CO2 | A | 14 |
|  | b. | Describe the scattering by a screened Coulomb potential and evaluate the scattering cross-section. | CO2 | E | 6 |
|  |  |  |  |  |  |
| 5. | a. | Obtain the transition probabilities using the semi-classical theory. Discuss how the theory is used to explain the spontaneous and induced emission of radiation. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | The state of an ensemble is well explained by the density matrix. Elaborate in detail. | CO3 | U | 10 |
|  | b. | The simplest example of a density matrix is the one describing the average spin state of an ensemble of particles. Discuss. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | In the relativistic aspect of quantum mechanics discuss the theory of Klein-Gordan to obtain the equation for a free particle and interpret the charge and current densities associated with it. | CO4 | An | 10 |
|  | b. | Based on Klein-Gordan equation discuss its effect in an electromagnetic field. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Establish Dirac’s relativistic wave equation for a free particle and extend it to obtain the Dirac’s matrices. | CO4 | A | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the quantization of wave field on the basis of the following,   1. Classical Lagrangian equation 2. Classical Hamiltonian equation | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the systems that are subjected to different time dependent perturbations such as harmonic, sudden and adiabatic. |
| CO2 | Classify the quantum problems involving scattering and interpret them using approximations such as Born, Partial wave analysis etc. |
| CO3 | Solve the quantum mechanical systems related to radiation by using the semiclassical theory. |
| CO4 | Apply relativistic wave equation to study hydrogen like atom, free particle and other relativistic problems. |
| CO5 | Appraise on the quantization of wave field, non-relativistic equation, electromagnetic field energy and momentum. |
| CO6 | Develop appropriate skill in analytical, theoretical and/or practical techniques to further their understanding in the chosen topic. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 | - | - | - | - | 40 |
| CO2 | - | 20 | 14 | - | 6 | - | 40 |
| CO3 | - | 20 | - | 20 | - | - | 40 |
| CO4 | - | - | 20 | 10 | - | - | 30 |
| CO5 | - | - | 10 | - | - | - | 10 |
| CO6 | - | - | - | 20 | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20PH3010** | **Duration** | **3hrs** |
| **Course Name** | **SPECTROSCOPY II** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Estimate the number of NMR signals in case of the molecule ethane. | CO1 | U | 5 |
|  | b. | With a neat schematic diagram, explain the working of NMR spectrometer. | CO1 | An | 10 |
|  | c. | The peak of acetone occurs at 880 Hz down field from TMS on a 400 MHz spectrometer. In the above case, calculate the ppm value. | CO1 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the reason for magnetic moment behind the spherical nucleus of spin value I = ½. | CO1 | R | 5 |
|  | b. | Explain the theory behind the working principle of NMR spectroscopy technique with emphasis on α and β states. | CO1 | An | 10 |
|  | c. | Describe Magnetic Resonance Imaging spectroscopy and give its applications. | CO1 | U | 5 |
|  |  |  |  |  |  |
| 3. | a. | Explain the types of species that could be examined using ESR method. | CO2 | A | 5 |
|  | b. | Estimate the value of Bohr magneton with a detailed derivation. | CO2 | U | 10 |
|  | c. | Compare the ESR and NMR signals. | CO2 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Name the fundamental magnetic moment unit of an electron and a neutron. | CO2 | R | 5 |
|  | b. | Interpret the hyperfine signals in case of ESR spectra of a hydrogen atom. | CO2 | U | 10 |
|  | c. | Calculate the frequency of microwave in ESR spectroscopy where the given magnetic field value is 0.3 T. | CO2 | A | 5 |
|  |  |  |  |  |  |
| 5. | a. | Define Quadrupole moment with a neat diagram. | CO3 | R | 5 |
|  | b. | With a neat diagram illustrate the NQR spectrometer used in drug analysis. | CO3 | An | 10 |
|  | c. | Compare the types of non-spherical nuclei with examples. | CO3 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Justify the NQR spectroscopy as Zero field NMR. | CO3 | R | 5 |
|  | b. | Discuss the working principle of NQR with energy level diagram of any NQR nuclei as an example. | CO3 | A | 10 |
|  | c. | Interpret the role of nitrogen and chlorine in compound analysis using NQR. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 7. | a. | Define Doppler shift and give examples. | CO4 | R | 5 |
|  | b. | Interpret the Isomer shift in Mossbauer spectroscopy. | CO4 | A | 10 |
|  | c. | Discuss the effect of relative motion between source and absorber atom in a Mossbauer spectrometer. | CO4 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define quadrupole effect with examples. | CO4 | R | 5 |
|  | b. | Discuss the role of recoil energy and the methods to overcome it in Mossbauer spectroscopy. | CO4 | U | 10 |
|  | c. | Calculate the Doppler shift in Mossbauer spectroscopy if frequency of source is 3.48 x 1018 Hz, velocity between source and absorber is 2.2 mm/sec. | CO4 | An | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a note on ionization chamber. | CO5 | R | 5 |
|  | b. | With a neat diagram explain the working principle of mass spectrometer. | CO5 | U | 10 |
|  | c. | List the applications of mass spectrometer. | CO6 | R | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the role of nuclei spin to know the structure of matter through NMR technique. |
| CO2 | Appreciate the physics of electron spin used in ESR technique. |
| CO3 | Determine the structure of molecules using NQR spectroscopic technique |
| CO4 | Appreciate the principles and working of Mossbauer spectroscopy. |
| CO5 | Analyze the structure of matter using mass spectroscopy. |
| CO6 | Identify the best method to solve the spectroscopic problems |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 10 | 5 | 20 |  |  | 40 |
| CO2 | 5 | 25 | 10 |  |  |  | 40 |
| CO3 | 10 | 10 | 10 | 10 |  |  | 40 |
| CO4 | 10 | 15 | 10 | 5 |  |  | 40 |
| CO5 | 5 | 10 |  |  |  |  | 15 |
| CO6 | 5 |  |  |  |  |  | 5 |
|  | | | | | | | **180** |



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| **Course Code** | **20PH3011** | **Duration** | **3hrs** |
| **Course Name** | **NUCLEAR AND PARTICLE PHYSICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Calculate the total binding energy and binding energy per nucleon for an Iron-56 nucleus with atomic number (Z) 26 and neutron number (N) 30. [Use the provided values: av = 15.5 MeV, as = 16.8 MeV, ac = 0.72 MeV, asym = 23 MeV, and ap = 34 MeV]. | CO1 | A | 4 |
|  | b. | Apply the Schrödinger wave equation to determine the energy eigenvalues and eigen functions for an electron particle confined within a one-dimensional infinite potential well. | CO1 | U | 16 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the method of employing high-energy electron beams to observe the nucleus, given that light rays are inadequate for this purpose. Utilize the de Broglie wavelength concept to identify which of the following energy levels (400 keV, 400 MeV, 400 GeV) can be utilized for nucleus visualization. | CO1 | An | 4 |
|  | b. | Derive an expression to assess the stability of a nucleus and formulate an equation reminiscent of a parabola using the semi-empirical mass formula for a specific isobaric nuclear family. | CO1 | R | 16 |
|  |  |  |  |  |  |
| 3. | a. | Find the distance at which the nuclear density would fall to 0.7 of its initial value. [Given that ρo=0.17 nucleons/fm3, R=7.44 fm, a=0.5 fm. The Woods-Saxon function is given by ] . | CO2 | An | 4 |
|  | b. | Consider the lowest energy state of a deuteron as the sole confined energy state within a deuterium nucleus and formulate an expression for the ground state energy of the deuteron and calculate its value. | CO2 | R | 16 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give brief definitions for spin-orbit and tensor forces in the context of nuclear forces. | CO2 | A | 4 |
|  | b. | Demonstrate the charge independence of nuclear forces by applying the Schrödinger time-independent wave equation. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 5. | a. | Fill in the blanks. | CO3 | U | 4 |
|  | b. | Explain the procedure of alpha particle decay and derive an expression for the Q value of the alpha decay process. | CO3 | An | 16 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Give a concise explanation of nuclear isomerism, a distinct property occurring within one of the natural radioactive decay modes. | CO6 | E | 4 |
|  | b. | Elaborate on Fermi's theory of inverse beta decay by incorporating essential quantum mechanical principles. | CO6 | E | 16 |
|  |  |  |  |  |  |
| 7. | a. | Identify and list the different components of a nuclear power reactor. | CO4 | U | 4 |
|  | b. | Distinguish and highlight the key distinctions between an open nuclear fuel cycle and a closed nuclear fuel cycle, thereby specifying India's approach. Elucidate the Indian three-stage nuclear power program in detail. | CO4 | A | 16 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Calculate the value of the constant ‘k’ if the energy of the incoming neutron beam is around 40 MeV and the depth of the potential well of the scattering center is 36 MeV. Assume the reduced mass of the system is given by m = 0.835 x 10-27 kg. Given that the wave function of the neutron beam in neutron proton scattering is given by after the interaction. | CO4 | U | 4 |
|  | b. | Apply 'Partial Wave Analysis' to derive expressions for nuclear reaction cross-section and level width in nuclear reactions. | CO4 | R | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Classify and group the following fundamental particles according to the international system of classification of elementary particles.  Electron, graviton, k-meson, muon, omega particle, photon, pion, proton, tau particle, w-boson. | CO5 | A | 4 |
|  | b. | Elaborate on the distinctions among the four fundamental forces of nature and specify the force carrier particles associated with each category. | CO5 | An | 16 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** | | | | | | | |
| CO1 | Understand the basic structure of the nucleus and apply Weizsacker semi-empirical mass formula for determining the nuclear stability. | | | | | | | |
| CO2 | Comprehend the nature of nuclear forces and its applications to real physical systems of nuclei. | | | | | | | |
| CO3 | Apply the radioactive properties of certain nuclides for water, food, health, and energy sectors. | | | | | | | |
| CO4 | Analyze different types of nuclear reactions with special reference to nuclear fission and fusion reactions and their applications to nuclear power reactors. | | | | | | | |
| CO5 | Evaluate the classification scheme of fundamental forces and particles and their relevance to various applications in physics. | | | | | | | |
| CO6 | Create new concepts in physics by comprehending the latest research in nuclear and particle physics. | | | | | | | |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | | |
| **CO / P** | | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | | 16 | 16 | 4 | 4 | -- | -- | 40 |
| CO2 | | 16 | 16 | 4 | 4 | -- | -- | 40 |
| CO3 | | -- | 4 | -- | 16 | -- | -- | 20 |
| CO4 | | 16 | 8 | 16 | -- | -- | -- | 40 |
| CO5 | | -- | -- | 4 | 16 | -- | -- | 20 |
| CO6 | | -- | -- | --- | --- | 20 | -- | 20 |
|  | | | | | | | | **180** |



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| **Course Code** | **20PH3012** | **Duration** | **3hrs** |
| **Course Name** | **SOLID STATE PHYSICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **Course Outcome** | **Bloom’s Level** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain Brillouin zone with the help of Bragg’s law and sketch the 1st and 2nd Brillouin zone. | CO 1 | U | 10 |
|  | b. | Derive the relation for effective mass of electron and relate the effective mass of electrons in metals, insulators and semiconductors. | CO 1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the hysteresis curve in ferroelectric materials. | CO 2 | U | 10 |
|  | b. | Deduce an expression for the Clausius- Mossotti relation. | CO 2 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Distinguish between anti-ferro magnetic and ferrimagnetic materials with examples. | CO 3 | A | 10 |
|  | b. | Demonstrate the hysteresis loop corresponding to ferromagnetic materials. | CO 3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the type of magnetism exhibited by Fe3O4 and Y3Fe5O12 with suitable sketch | CO 3 | U | 10 |
|  | b. | Analyze the dependence of anti-ferromagnetism on temperature with a suitable example and mention the applications of anti-ferromagnetic materials. | CO 3 | An | 10 |
| 5. | a. | Discuss the magnetic properties of materials and explain the concept of Bohr magnetron. | CO 4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain Langevin’s theory of paramagnetism and illustrate that the inverse of susceptibility varies linearly with temperature | CO 4 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Explain the different types of point, line, and surface defects with suitable sketch. | CO 5 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the non-stoichiometric methods to produce colour centers. | CO 5 | U | 5 |
|  | b. | Summarize Thermo luminescence and Electro luminescence with applications. | CO 5 | U | 15 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Differentiate type I and type II superconductors and mention their applications. | CO6 | U | 15 |
|  | b. | Describe the functioning of Maglev train. | CO6 | U | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the crystal properties and elementary models for bonding of atoms and molecules. |
| CO2 | Explain the concepts leading to dielectric and ferroelectric properties in detail. |
| CO3 | Interpret the fundamental ideas of magnetic properties in solid state phenomena. |
| CO4 | Describe the theories involved in the magnetic and superconducting materials phenomena. |
| CO5 | Illustrate optical properties of materials and its importance in luminescence applications. |
| CO6 | Apply the solid-state physical phenomena in the areas of superconductors and its applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **U** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 10 | 10 |  |  |  | 20 |
| CO2 |  | 10 | 10 |  |  |  | 20 |
| CO3 |  | 30 |  | 10 |  |  | 40 |
| CO4 |  | 40 |  |  |  |  | 40 |
| CO5 |  | 40 |  |  |  |  | 40 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



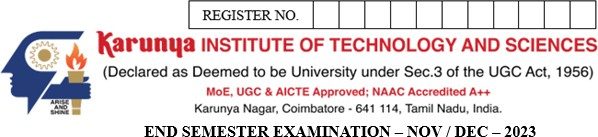
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| **Course Code** | **22PH3001** | **Duration** | **3hrs** |
| **Course Name** | **SOLID STATE IONICS AND ENERGY DEVICES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Distinguish Ionic and covalent solids with energy materials as examples. | CO1 | U | 5 |
|  | b. | Explain any two methods of making polymer membranes in detail. | CO1 | An | 10 |
|  | c. | Illustrate the role of graphite structure as an anode for lithium ion batteries. | CO1 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | List the advantages and limitations of natural polymer to be used in energy devices. | CO1 | R | 5 |
|  | b. | Compare the characteristics of miscible and immiscible polymer blends. | CO1 | An | 10 |
|  | c. | Differentiate SWNT and MWNT. | CO1 | U | 5 |
|  |  |  |  |  |  |
| 3. | a. | Explain superionic conductors and give examples. | CO2 | A | 5 |
|  | b. | Describe the importance of BASE as a solid electrolyte in energy devices. | CO2 | U | 10 |
|  | c. | Illustrate the role of glass transition temperature in polymer electrolytes. | CO2 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | List the advantages of the polymer invented by the company Bellcore. | CO2 | R | 5 |
|  | b. | Describe the role of different types of polymer membranes for ionic transport. | CO2 | U | 10 |
|  | c. | Explain the role of fillers and plasticizers in membrane electrolyte. | CO2 | A | 5 |
|  |  |  |  |  |  |
| 5. | a. | Examine the impedance plot of a pure resistance. | CO3 | R | 5 |
|  | b. | Analyze the principle steps involved in AC impedance spectroscopy. | CO3 | An | 10 |
|  | c. | Classify dielectric constant and dielectric loss. | CO3 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Define transparent number and mention its importance. | CO3 | R | 5 |
|  | b. | Illustrate the role of Nyquist plot with a neat diagram. | CO3 | A | 10 |
|  | c. | Trace the impedance plot in case of a pure capacitance. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 7. | a. | Define a pseudocapacitor. | CO4 | R | 5 |
|  | b. | Illustrate the working principle of EDLC with a neat diagram. | CO4 | A | 10 |
|  | c. | Classify the lithium and sodium ion battery based on their energy density. | CO4 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define symmetric supercapacitor with examples. | CO4 | R | 5 |
|  | b. | Classify the types of supercapacitors with suitable examples. | CO4 | U | 10 |
|  | c. | Compare hard and activated carbon. | CO4 | An | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Define Faradaic process. | CO5 | R | 5 |
|  | b. | Compare three electrode and four electrode experiments. | CO5 | U | 10 |
|  | c. | Describe the role of chronoamperometry as an electrochemical technique. | CO6 | R | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the types of materials based on structure. |
| CO2 | Understand the electrical properties of mixed and ionically conducting materials. |
| CO3 | Analyse the electrical and electrochemical properties of materials. |
| CO4 | Apply the knowledge of materials for making energy devices. |
| CO5 | Evaluate the energy storage devices. |
| CO6 | Create alternative energy storage devices to existing once. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 10 | 5 | 20 |  |  | 40 |
| CO2 | 5 | 25 | 10 |  |  |  | 40 |
| CO3 | 10 | 10 | 10 | 10 |  |  | 40 |
| CO4 | 10 | 15 | 10 | 5 |  |  | 40 |
| CO5 | 5 | 10 |  |  |  |  | 20 |
| CO6 | 5 |  |  |  |  |  |  |
|  | | | | | | | **180** |



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| **Course Code** | **23PH2001** | **Duration** | **3hrs** |
| **Course Name** | **NANOMATERIALS AND ENERGY DEVICES** | **Max. Marks** | **100** |

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| **Q.**  **No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Mention the Quantum state of thin films. | | CO1 | U | 1 |
| 2. | State the de Broglie hypothesis. | | CO1 | R | 1 |
| 3. | Mention the colour of gold when it is reduced to the scale of one angstrom unit. | | CO2 | An | 1 |
| 4. | Surface to volume ratio due to size reduction to nanoscale. | | CO2 | A | 1 |
| 5. | Surface energy increased due to increase in area. | | CO2 | U | 1 |
| 6. | Name the semiconducting carbon nanotubes among the three classifications. | | CO3 | U | 1 |
| 7. | Thiols are the chemicals coated on for electronic coupling between them. | | CO3 | AN | 1 |
| 8. | Super paramagnetim has no in the hysterics curve. | | CO3 | An | 1 |
| 9. | Short circuit is the current form a solar cells. | | CO4 | U | 1 |
| 10. | Name a secondary battery and the materials used as electrodes. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | State Hysenberg Uncertainty principle and mention the physical parameters that can’t be measured simultaneously. | | CO1 | R | 3 |
| 12. | Define exciton pair. | | CO1 | U | 3 |
| 13. | Draw the optical band gap that undergo splitting due to size reduction. | | CO2 | AN | 3 |
| 14. | Illustrate the blue shift in nano materials. | | CO3 | AN | 3 |
| 15. | Draw the domain growth and domain rotation in the magnetic properties of nanomaterials. | | CO3 | AN | 3 |
| 16. | Write short note on the Spintronics. | | CO4 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Illustrate the density of state for different quantum states and explain the step like structure in the nanoscale. | CO1 | U | 10 |
|  | b. | State the assumptions taken for the defining the debroglie wave length. | CO1 | U | 2 |
|  |  |  |  |  |  |
| 18. | a. | Demonstrate the electron confinement in the quantum well, quantum wire and quantum dot with neat schematic. | CO1 | A | 10 |
|  | b. | Define quantum dot and the unit in which it is measured. | CO1 | U | 2 |
|  |  |  |  |  |  |
| 19. | a. | Demonstrate the colour change of gold due to size reduction of bulk to the nanoscale. | CO2 | A | 8 |
|  | b. | Analyze the band structure of nano materials. | CO2 | AN | 4 |
|  |  |  |  |  |  |
| 20. | a. | Summarize the properties of nanomaterials. | CO2 | U | 10 |
|  | b. | Draw the super paramagnetic hysteresis and mention the salient features. | CO3 | AN | 2 |
|  |  |  |  |  |  |
| 21. | a. | Analyze the electrical properties of gold nano particles and the step potential exhibited by them. | CO3 | AN | 12 |
|  |  |  |  |  |  |
| 22. | a. | Analyze the magnetic properties of nano materials and draw the domain changes happen due to size reduction. | CO3 | AN | 12 |
|  |  |  |  |  |  |
| 23. | a. | Evaluate the Quantum Dot solar cells and the utilization of full solar spectrum. | CO4 | EV | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the principle of electro deposition. | CO5 | U | 2 |
|  | b. | Demonstrate the working of any secondary battery with a neat schematic | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Classify the quantum states upon size reduction to nanoscale |
| CO2 | Distinguish the physical properties of bulk and nano materials |
| CO3 | Analyse the structural and optical properties of nano materials |
| CO4 | Analyse the magnetic and electrical properties of naomaterilas |
| CO5 | Demonstrate the working of lithium ion battery |
| CO6 | Design super capacitor using nano materials |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 4 | 18 | 10 |  |  |  | 32 |
| CO2 |  | 11 | 9 | 8 |  |  | 28 |
| CO3 |  | 1 |  | 34 |  |  | 35 |
| CO4 |  | 4 |  |  | 12 |  | 16 |
| CO5 | 1 | 2 |  |  |  |  | 3 |
| CO6 |  | 10 |  |  |  |  | 10 |
|  | | | | | | | **124** |



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| **Course Code** | **23PH3037** | **Duration** | **3hrs** |
| **Course Name** | **RADIATION TREATMENT AND PLANNING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | State the role and significance of the Accelerating Wave Guide in a Linear Accelerator (LINAC), and how it is applied to the generation of high-energy particle beams for applications in medical diagnostics. | CO1 | A | 4 |
|  | b. | Explain in detail how X-rays and Gamma rays differ in terms of their generation, energy levels, and applications in various fields, such as medical imaging, and nuclear physics research. | CO1 | U | 16 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compare and contrast the use of Cobalt-60 radiation therapy with Linear Accelerators (LINACs) in cancer treatment, considering factors like safety, flexibility, and treatment effectiveness. | CO1 | An | 4 |
|  | b. | Explain the fundamental mechanisms and technologies employed in the production of both photon and electron beams from a Linear Accelerator (LINAC). | CO1 | R | 16 |
|  |  |  |  |  |  |
| 3. | a. | Analyze the difference between any two photon beam sources. | CO2 | An | 4 |
|  | b. | Apply Clarkson’s method for dose calculation and explain the procedure in detail. | CO2 | R | 16 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Apply Batho Power Law method for correcting field inhomogeneity. | CO2 | A | 4 |
|  | b. | State the concepts of inverse square law, build-up region and depth dose maximum, and hence, discuss the importance of different ratios in radiation treatment planning. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 5. | a. | Infer the differences between Gross Tumor Volume (GTV), Clinical Target Volume (CTV), and Internal Target Volume (ITV). | CO3 | U | 4 |
|  | b. | By applying the principles of radiation safety, explain how Quality Assurance (QA) is maintained on a day-to-day basis in radiation treatment of cancer patients. | CO3 | An | 16 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Evaluate the advantages of bolus and compensating filters in cancer treatment. | CO6 | E | 4 |
|  | b. | Evaluate the different dosimetric indices used for treatment plan comparison in detail. | CO6 | E | 16 |
|  |  |  |  |  |  |
| 7. | a. | Explain the effective means of finding the range of electrons in air. | CO4 | U | 4 |
|  | b. | List the characteristics of gamma ray photons. Analyze how gamma rays interact with matter surrounding them. | CO1 | A | 16 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the phenomenon of a virtual source in a clinical electron beam in brief and state any two methods for determining the virtual Source to Surface Distance (virtual SSD). | CO4 | U | 4 |
|  | b. | Explain the occurrence of field inhomogeneity in electron beam therapy. | CO4 | R | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write the details of application of Surface Guided Radio Therapy (SGRT) in the treatment of cancer. | CO5 | A | 4 |
|  | b. | Compare and contrast the modern day treatment techniques such as Intensity Modulated Radio Therapy (IMRT) and Volume Modulated Arc Therapy (VMAT). | CO5 | An | 16 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Examine the advanced information about radiotherapy machines. |
| CO2 | Distinguish different types of interaction of photon beams with matter. |
| CO3 | Apply various calibration methods to ensure better quality treatment using machines. |
| CO4 | Analyze the various clinical treatment planning. |
| CO5 | Evaluate the various radiation treatment modalities. |
| CO6 | Create better treatment modalities using electron beam therapy and advanced radiotherapy treatment methods like Cyberknife. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 16 | 16 | 20 | 4 | -- | -- | 56 |
| CO2 | 16 | 16 | 4 | 4 | -- | -- | 40 |
| CO3 | -- | 4 | -- | 16 | -- | -- | 20 |
| CO4 | 16 | 8 | -- | -- | -- | -- | 24 |
| CO5 | -- | -- | 4 | 16 | -- | -- | 20 |
| CO6 | -- | -- | --- | --- | 20 | -- | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **23PH3038** | **Duration** | **3hrs** |
| **Course Name** | **MEDICAL RADIATION DOSIMETRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give an example for beta minus decay and beta plus decays. | CO1 | A | 4 |
|  | b. | There is a radiation source containing alpha particle, beta particle and gamma ray emitting radionuclides inside the body. Infer which radiation is more harmful. For that particular radiation, describe the decay scheme in detail with an equation. | CO1 | U | 16 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the terms mass defect and binding energy of a nucleus. | CO1 | An | 4 |
|  | b. | Discuss in detail classification of radiations based on their ionizing powers and describe them in detail. | CO1 | R | 16 |
|  |  |  |  |  |  |
| 3. | a. | Analyze briefly the ways in which gamma ray interacts with matter. | CO2 | An | 4 |
|  | b. | Discuss in detail, the ways in which a beta particle interacts with matter surrounding the parent radionuclide. | CO2 | R | 16 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the predicament of a photon is not conserved in the pair production process in the nuclear Coulomb field. | CO2 | A | 4 |
|  | b. | As per quantum electrodynamics, Compton Scattering is an incoherent process in which energy is transferred a recoil electron from an incoming gamma photon. Derive an expression for the same. | CO2 | U | 16 |
|  |  |  |  |  |  |
| 5. | a. | Deduce the phenomenon in which electron, being a charged particle, radiate electromagnetic energy when they are in motion. | CO3 | U | 4 |
|  | b. | Explain the theory of deriving the absorbed dose to the medium within the cavity and relating it to the absorbed dose that would be at that point in the surrounding medium in the absence of the cavity. | CO3 | An | 16 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe energy fluence and the means to calculate the same. | CO4 | An | 4 |
|  | b. | Discuss in detail Linear Energy Transfer hypothesis in which the energy is deposited at the point of interest per unit length of the charged particle track. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 7. | a. | Identify the important characteristics for chemical dosimetric materials. | CO6 | U | 4 |
|  | b. | Point out the ideal requirements for a thermo-luminescent dosimetric material and explain in detail a few TLD phosphors and their characteristics. | CO6 | A | 16 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | List out the important properties necessary for a dosimeter. | CO6 | U | 4 |
|  | b. | Examine the functioning of a Geiger-Muller counter and describe its working with a neat sketch. | CO5 | R | 16 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Compare and contrast the calibration standards required for mega voltage photon beams and electron beams. | CO5 | A | 4 |
|  | b. | Analyze in detail the application of Image Guidance in modern day Radiation Therapy units. | CO5 | An | 16 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Compare and contrast between an atom and a nucleus and other critical ideas related to them. |
| CO2 | Differentiate between the types of radiation emitted from nuclear sources. |
| CO3 | Apply the interaction of radiation with matter in novel peaceful applications. |
| CO4 | Analyze and understand the various units of radiation measurements. |
| CO5 | Evaluate the different types of radiation detection and measurement. |
| CO6 | Create novel dosimetry systems for measuring different types of nuclear radiation. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 16 | 16 | 4 | 4 |  |  | 40 |
| CO2 | 16 | 16 | 4 | 4 |  |  | 40 |
| CO3 |  | 4 |  | 16 |  |  | 20 |
| CO4 |  |  | 16 | 4 |  |  | 20 |
| CO5 | 16 |  | 4 | 16 |  |  | 36 |
| CO6 |  | 8 | 16 |  |  |  | 24 |
|  | | | | | | | **180** |