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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define effective mass of electrons and explain the concept of hole. | CO1 | U | 5 |
|  | b. | Derive the expression for electrical conductivity of conductors. | CO1 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Distinguish dielectric materials and insulators with suitable examples. | CO4 | U | 5 |
|  | b. | With a neat sketch, explain the band theory of solids. | CO1 | U | 15 |
|  |  |  |  |  |  |
| 3. | a. | With a neat sketch, explain direct and indirect band gap semiconductors with suitable examples. | CO2 | U | 5 |
|  | b. | Explain the internal field or local field in liquids and solids with suitable sketch. | 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. | Differentiate the properties of Para, ferro and antiferro magnetic materials with adequate diagram. | CO6 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the concept of Bloch wall with a neat sketch. | CO6 | R | 5 |
|  | b. | Derive the expression for Clausius Mossotti equation. | CO5 | U | 15 |
|  |  |  |  |  |  |
| 7. |  | List the different types of crystal defects. Explain line defect and point defects and its underlying principle with adequate diagram in detail. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe Barkhausen effect in detail. | CO3 | R | 5 |
|  | b. | Explain Hall effect with a suitable sketch and list its applications. | CO4 | U | 15 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Derive the equation for net magnetization using quantum theory of magnetism. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 35 | - |  |  |  | 35 |
| CO2 | - | 25 | - |  |  |  | 25 |
| CO3 | 5 | 05 | - |  |  |  | 10 |
| CO4 | - | 35 | - |  |  |  | 35 |
| CO5 | 5 | 15 | - |  |  |  | 20 |
| CO6 | 5 | 50 |  |  |  |  | 55 |
|  | | | | | | | **180** |



**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How did Schrodinger represent the state vector and operators with respect to time. Discuss. | CO1 | U | 10 |
| b. | Interaction picture is the intermediate between Schrodinger and Heisenberg picture. Validate the statement. | CO1 | U | 10 |
| **(OR)** | | | | | |
| 2. | a. | Obtain the proof for the following theorems,   1. Hermitian operators have real eigen values. 2. Two eigen functions of Hermitian operators, belonging to different eigen values, are orthogonal. | CO1 | U | 10 |
| b. | Give a clear outline on the operator formalism in quantum mechanics. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. |  | Deduce the Schrodinger time independent wave equation for a particle in a one dimensional potential well and obtain its energy and wave function. | CO2 | A | 20 |
| **(OR)** | | | | | |
| 4. |  | Find the eigen value of the one dimensional linear harmonic oscillator by obtaining and solving its wave equation. | CO3 | An | 20 |
|  |  |  |  |  |  |
| 5. |  | Prove the following.   1. [J2, Jy] = 0 2. [Jz, J-] = - (h/2π) J- 3. [J+, J-] = (h/π) Jz | CO4 | A | 20 |
| **(OR)** | | | | | |
| 6. |  | Obtain the eigen value of the following.   1. J+ and J- 2. Jx and Jy | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. |  | 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. |  | Outline variation method and apply it to calculate the energy of the ground state helium atom. | CO6 | A | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | How did Thomas-Fermi model explain the behavior of many electron systems. Elucidate in detail. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 | - | - | - | - | 40 |
| CO2 | - | - | 20 | - | - | - | 20 |
| CO3 | - | - | - | 20 | - | - | 20 |
| CO4 | - | - | 40 | - | - | - | 40 |
| CO5 | - | - | - | 20 | - | - | 20 |
| CO6 | - | 20 | 20 | - | - | - | 40 |
|  | | | | | | | **180** |

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Illustrate the parts of an electron microscope. | CO1 | U | 5 |
|  | b. | Devise an experiment using the scanning electron microscope to identify the nanoparticles. | CO1 | An | 15 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Analyze the electrical properties of thin films when the thickness is negligible compared to the substrate using four-probe method. | CO2 | An | 20 |
|  |  |  |  |  |  |
| 3. |  | Describe the principle of atomic force microscope and differentiate between the three different modes of scanning. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Sketch the block diagram explaining the process of secondary ion mass spectroscopy and explain the working principle of SIMS. | CO4 | U | 15 |
|  | b. | With a neat sketch, describe the role of each part in Auger Electron Spectroscopy. | CO4 | U | 5 |
|  |  |  |  |  |  |
| 5. |  | Device an experiment using vibrating sample magnetometer to interpret the hysteresis curve obtained for a ferromagnetic material. | CO5 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Analyze the UV-Visible spectrum and explain regions of importance as well as the interpretation for blue shift and red shift. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Assume that you have been given a metal oxide thin film sample for characterization. List the analyses you will perform to identify the material, its morphology, transmittance percentage, and recombination effects. | CO2 | A | 4 |
|  | b. | Explain the principle and working of the scanning tunneling microscope with an appropriate block diagram for analyzing the properties of a given material. | CO3 | U | 16 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the instrumentation and working principle of XPS with a clear sketch. | CO4 | U | 16 |
|  | b. | List the advantages and disadvantages of XPS. | CO4 | R | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain in detail how thermo-gravimetric analysis (TGA) is used to analyze the mass loss of a compound under study. | CO6 | U | 15 |
|  | b. | List the advantages and applications of TGA. | CO6 | R | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 structural 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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 5 | - | 35 | - | - | 40 |
| CO2 | - | - | 4 | 20 | - | - | 24 |
| CO3 | - | 36 | - | - | - | - | 36 |
| CO4 | 4 | 36 | - | - | - | - | 40 |
| CO5 | - | - | - | 20 | - | - | 20 |
| CO6 | 5 | 15 | - | - | - | - | 20 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | |
| 1. | Give an example for semiconductor laser. | | | CO1 | R | 1 |
| 2. | Calculate the energy of a photon released by Helium-Neon laser if the wavelength emitted is 6328 Å. | | | CO1 | U | 1 |
| 3. | Calculate the critical angle of an optical fiber if the refractive indices of the core and cladding are 1.55 and 1.45 respectively. | | | CO2 | R | 1 |
| 4. | Define the term critical angle. | | | CO2 | U | 1 |
| 5. | Calculate the energy of a photon with a frequency of 3.0184 x 1020 Hz in terms of Joules. | | | CO3 | R | 1 |
| 6. | State the Heisenberg Uncertainty principle. | | | CO3 | U | 1 |
| 7. | Calculate the intensity level of a thunder storm if the intensity of sound produced by the thunder is 100 db. | | | CO4 | R | 1 |
| 8. | Write the Weber-Fechner formula. | | | CO4 | U | 1 |
| 9. | Find out the depth of a particular area of Arabian sea if the time for ultrasonic wave to travel to and fro is about 6 seconds. The speed of ultrasound waves in sea water is 1560 m/s. | | | CO5 | R | 1 |
| 10. | List the properties of ultrasonic waves. | | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | |
| 11. | Explain the term “Population Inversion.” | | | CO1 | U | 3 |
| 12. | Find out the numerical aperture of an optical fiber cable if the refractive index of its core is 1.6 and the refractive index of its cladding is 1.45. | | | CO2 | A | 3 |
| 13. | State Hooke’s law. | | | CO3 | U | 3 |
| 14. | Calculate the de Broglie wavelength of an electron matter wave which is accelerated by a potential of 100 V. | | | CO4 | A | 3 |
| 15. | Point out how sound waves are classified based on frequency. | | | CO5 | U | 3 |
| 16. | Calculate the speed of ultrasound in methyl alcohol if the distance between two adjacent nodes ‘d’ is 2.020 x 10-4m and the frequency of the ultrasound produced is 2.73 x 106 Hz. | | | 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. | With a neat diagram, describe the principle, construction and working of a Helium-Neon laser with necessary energy level transitions. | CO1 | | A | 10 |
|  | b. | Calculate the band gap energy of a semiconductor laser whose wavelength of emission is 6212 Å. | CO1 | | A | 2 |
|  |  |  |  | |  |  |
| 18. | a. | List the classification of optical fiber cables based on modes of transmission of light and the refractive index profile of core and cladding with suitable drawings. | CO2 | | An | 10 |
|  | b. | An fiber optical cable is having core and cladding refractive indices as 1.65 and 1.55. Calculate the acceptance angle of the same. | CO2 | | An | 2 |
|  |  |  |  | |  |  |
| 19. | a. | Elaborate on the method of finding the Young’s modulus of a wooden beam by uniform bending method. | CO3 | | A | 10 |
|  | b. | Point out the methods in which heat, in general, is conducted from one medium to another medium. | CO3 | | A | 2 |
|  |  |  |  | |  |  |
| 20. | a. | Apply Schrodinger’s wave equation to the problem of a particle in a box and arrive at Eigen function and Eigen values of the same. | CO4 | | An | 10 |
|  | b. | A particle is having a mass of 0.511 MeV/c2 and has a kinetic energy of 100 eV. Find its de Broglie wavelength. | CO4 | | An | 2 |
|  |  |  |  | |  |  |
| 21. | a. | State the factors affecting the acoustics of a good auditorium. Explain in detail how they affect the quality of sound and suggest suitable remedies for the same. | CO5 | | An | 10 |
|  | b. | Calculate the reverberation time of a large auditorium whose volume is (100\*40\*20) and the total absorption coefficient is 8000 O.W.U. or sabines. | CO5 | | An | 2 |
|  |  |  |  | |  |  |
| 22. | a. | Explain the recording of a hologram with necessary diagrams. | CO1 | | R | 6 |
|  | b. | Calculate the number of photons emitted by a Carbon-di-oxide laser per second. The energy of a single photon emitted by this laser is 1.875 x 10-20 J. The power level of this laser is 1.875 x 103 W. | CO2 | | R | 6 |
|  |  |  |  | |  |  |
| 23. | a. | Discuss in detail with necessary block diagram, the working of an optical fiber communication system. | CO3 | | U | 6 |
|  | b. | A step index fiber has a numerical aperture of 0.16, a core refractive index 1.450 and a core diameter of 90 μm. The cladding refractive index is 1.4. Calculate critical angle of this optical fiber cable. | CO4 | | U | 6 |
| **COMPULSORY QUESTION** | | | | | | |
| 24. | a. | Define inverse piezoelectric effect. Ultrasonic waves can be produced in a piezoelectric oscillator. Explain the same with the needed circuit diagram and equations. | CO6 | | R | 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. | CO6 | | R | 2 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | To impart knowledge on the working principle of various lasers and its application in Fibre optics. |
| **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 ultrasonics. |
| **CO5** | Design devices based on ultrasonic generators. |
| **CO6** | Design novel instruments for food processing applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **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** | 12 | --- | 3 | --- | --- | --- | **15** |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Illustrate the visual acuity assessment for the 0-1 year age group, providing necessary examples and details. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Explain the different types of color vision charts used in color vision assessment. | CO1 | A | 20 |
|  |  |  |  |  |  |
| 3. | a. | Describe the procedure involved in the examination of the cornea. | CO2 | R | 6 |
|  | b. | Elucidate the techniques of slit-lamp illumination in patient treatment, explaining their application. | CO2 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain the principles, instrumentation, and procedure of indirect ophthalmoscopy, and discuss its advantages and limitations in patient care. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. |  | Illustrate the working of Schiotz and Goldmann applanation tonometers with detailed diagrams. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Interpret the Van Herick anterior chamber (AC) grading method briefly. | CO4 | A | 6 |
|  | b. | Explain in detail the Amsler grid, its use, and different types of Amsler charts with adequate diagrams. | CO4 | An | 14 |
|  |  |  |  |  |  |
| 7. | a. | Explain macular function tests briefly. | CO5 | R | 6 |
|  | b. | Illustrate various eye-watering tests performed during clinical examination with details. | CO5 | A | 14 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the qualitative assessment of central and peripheral visual fields. | CO5 | U | 6 |
|  | b. | Illustrate the visual pathway in detail and label its parts. | CO6 | A | 14 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Illustrate neuro- visual defects with necessary diagrams. | CO6 | An | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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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 examination and lacrimal examination |
| CO6 | Demonstrate the macular functioning and testing in ophthalmological condition |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 20 | 20 |  |  | 40 |
| CO2 | 6 |  |  | 14 |  |  | 20 |
| CO3 |  |  | 20 | 20 |  |  | 40 |
| CO4 |  |  | 6 | 14 |  |  | 20 |
| CO5 | 6 | 6 | 14 |  |  |  | 26 |
| CO6 |  |  | 14 | 20 |  |  | 34 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Analyze the causes of abnormality in psychology and discuss the four categories of abnormal behavior as outlined by Maher and Maher. | CO1 | An | 10 |
|  | b. | Define normality and discuss the four basic perspectives of normality. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the psychoanalytic theories of normality. | CO1 | U | 15 |
|  | b. | List the traits that a normal person possesses to a greater degree than an individual who is diagnosed as abnormal. | CO1 | R | 5 |
|  |  |  |  |  |  |
| 3. | a. | Explain the fundamental principles of Gestalt psychology and their influence on our perception of visual patterns and objects. | CO2 | U | 15 |
|  | b. | Define illusion and list the various types of illusions. | CO2 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the principles of perception and illustrate each principle with a relevant example. | CO2 | A | 10 |
|  | b. | Define attention and discuss the various types of attention, providing suitable examples. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Define the following terms in classical conditioning, providing suitable examples for each.   1. Habituation 2. Classical conditioning 3. Neutral stimulus 4. Extinction 5. Spontaneous recovery | CO3 | U | 15 |
|  | b. | Evaluate the effectiveness of Freud's iceberg theory and trait theory in therapeutic settings for personality disorders, discussing the strengths of each approach in addressing specific aspects of personality treatment. | CO3 | E | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the concept of intelligence and discuss the different types of intelligence that have been proposed in psychological theories. | CO3 | U | 15 |
|  | b. | Illustrate the three major types of behavioral learning and provide suitable examples for each. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 7. | a. | Define Ophthalmic counselling and list the types of counselling. | CO4 | R | 5 |
|  | b. | Evaluate the significance of various micro and macro skills in counseling, providing a suitable example. | CO4 | E | 15 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Analyze the defense mechanisms that individuals may employ when confronted with grief and loss and compare these with the stages of grief as outlined by renowned psychologist Elisabeth Kübler-Ross. | CO5 | An | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | 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 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 15 | 15 |  | 10 |  |  | 40 |
| CO2 | 5 | 25 | 10 |  |  |  | 40 |
| CO3 |  | 35 |  |  | 5 |  | 40 |
| CO4 | 5 |  |  |  | 15 |  | 20 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  |  |  |  |  | 20 | 20 |
|  | | | | | | | **180** |

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Categorize different types of symptoms present in identifying low vision in patients. | CO1 | U | 6 |
|  |  | Elucidate various methods used in color vision assessment in low vision aids. | CO1 | An | 14 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Illustrate non-optical demonstrative aids followed in low vision case management. | CO1 | A | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss various techniques used in the near vision assessment with necessary charts and examples. | CO2 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain the procedures in detail for the improvement of functional contrast and reduction of glare in low vision patients. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. | a. | Articulate the Keplerian optical design bioptic telescope and Ocutech VES in low vision aids treatment. | CO3 | An | 10 |
|  | b. | Explain the optometric telescope advantages, disadvantages, limitations and availability in low vision treatment. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Illustrate the low vision aid management of school-going RP patients in detail. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. | a. | Discuss different types of tints and their applications in spectacles used in low vision treatment. | CO5 | R | 10 |
|  | b. | Explain three low vision conditions, their clinical features as well as low vision clinical management in detail. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe different types of psychological stages in treating low vision patients. | CO5 | U | 6 |
|  | b. | Compare and contrast the advantages and disadvantages of telescopes while prescribing for school going children. | CO6 | A | 14 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Illustrate the visual rehabilitation processes for low vision patients in brief. | CO6 | A | 6 |
|  | b. | Explain the pathophysiology of age-related macular degeneration, Clinical features and Low vision management in detail. | CO6 | An | 14 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 | Appraise the concepts of fundus examination and lacrimal examination |
| CO6 | Demonstrate the macular functioning and testing in ophthalmological condition |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 6 | 20 | 14 |  |  | 40 |
| CO2 | 20 |  |  |  |  |  | 20 |
| CO3 |  |  | 20 | 10 |  |  | 30 |
| CO4 |  |  | 10 | 20 |  |  | 30 |
| CO5 | 10 | 6 | 10 |  |  |  | 26 |
| CO6 |  |  | 20 | 14 |  |  | 34 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Compare the spherical lens and the sphero-cylindrical lens in terms of their power in each meridian when used as corrective lenses. | CO1 | An | 10 |
|  | b. | If the source of light is at an infinite distance and the focal length is 2 cm, as shown in the figure below, write the lens equation and calculate the image distance.  The focal length of a normal eye-lens is about:$(a){\\text{ 1mm}}  \\\\(b){\\text{ 2cm}} \\\\(c){\\text{ 25cm}} \\\\(d){\\text{ 1m}} \\\\ $ | CO2 | A | 6 |
|  | c. | Write the differences between finished and semi-finished lenses used in lens design. | CO1 | A | 4 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the six different types of lenses used to treat various eye conditions. | CO1 | U | 10 |
|  | b. | Compare the roles of an ophthalmologist, optometrist, and optician. | CO2 | An | 6 |
|  | c. | Explain the radius of curvature of a lens with a neat schematic diagram. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 3. | a. | Write a detailed note on the importance of the optic centre in overcoming the prismatic effect. | CO4 | A | 16 |
|  | b. | image005In the figure given below, analyze the relationship between the interpupillary distance of the eyes and the optical center of the spectacles. | CO3 | An | 4 |
|  |  |  |  |  |  |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the rules of simple transposition. | CO4 | U | 14 |
|  | b. | Describe six desired qualities of a spectacle frame. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 5. | a. | Using the lens equation, calculate the power of the eye lens for viewing (i) the nearest object at 25 cm and (ii) the farthest object at infinity for a human eye. (Given: the image distance is 20 mm). | CO3 | A | 10 |
|  | b. | Apply the concept of the base curve to explain its role in optimizing the fit and comfort of spectacle lenses. Include a neat diagram to illustrate your explanation. | CO2 | A | 6 |
|  | c. | Define manual surfacing in the lens manufacturing process. | CO2 | R | 4 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Compare plastic lenses made from allyl diglycol carbonate (CR39), polycarbonate, and PMMA. | CO3 | A | 10 |
|  | b. | A person with a myopic eye cannot see objects beyond 1.2 m clearly. In this case, suggest a corrective lens to be used and calculate its power | CO2 | U | 6 |
|  | c. | List four important steps involved in the lens manufacturing process. | CO2 | R | 4 |
|  |  |  |  |  |  |
| 7. | a. | Draw a neat sketch of the pupil size under different light conditions and compare the role of manual and automated pupilometers. | CO5 | U | 10 |
|  | b. | Draw the shape of the cornea that indicates the eye condition called 'astigmatism' and explain the corrective measures to be taken. | CO5 | U | 6 |
|  | c. | The length of the line from the optic center to the farthest point on the lens is 27 mm, with A and B values as shown in the figure below. Calculate the effective power using the given values. | CO6 | A | 4 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the concept of pantoscopic tilt in optometry and discuss its significance in the fitting and performance of corrective lenses. | CO5 | U | 10 |
|  | b. | List three consequences of incorrect pantoscopic tilt adjustment. | CO5 | R | 6 |
|  | c. | Calculate the value of the axis in the following eye prescription: +4.25 SPH +2.5 CYL 090. | CO6 | A | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Compare bifocals, D-bifocals, and executive bifocal lenses based on their functions. | CO6 | A | 10 |
|  | b. | Describe trifocal lenses with a neat diagram. | CO6 | R | 5 |
|  | c. | Write a brief note on progressive addition lenses (PALs). | CO6 | A | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 14 | 4 | 10 |  |  | 28 |
| CO2 | 8 | 6 | 12 | 6 |  |  | 32 |
| CO3 |  | 6 | 20 | 4 |  |  | 30 |
| CO4 |  | 14 | 16 |  |  |  | 30 |
| CO5 | 6 | 26 |  |  |  |  | 32 |
| CO6 | 5 |  | 23 |  |  |  | 28 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | **Apply** the knowledge of corresponding retinal points to explain the phenomenon of stereopsis and its clinical significance in assessing binocular vision. | CO1 | A | 15 |
|  | b. | List five factors that can disrupt binocular vision and lead to visual discomfort. | CO1 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | **Employ** the principles of visual direction, and local sign, to explain the concept of egocentric localization. | CO1 | A | 15 |
|  | b. | **Define** the concept of binocular rivalry and its clinical implications. | CO1 | R | 5 |
|  |  |  |  |  |  |
| 3. | a. | **Explain** the neural pathways involved in binocular vision and discuss the potential impact of a brain injury on binocular function. | CO2 | A | 15 |
|  | b. | **Infer** the potential impact of early intervention on the visual development of a child with strabismus. | CO5 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | **Illustrate** the role of empirical cues in visual distance perception and develop a strategy for assessing this function in a patient with a neurological disorder. | CO2 | A | 15 |
|  | b. | **Classify** different types of non-surgical treatment modalities used for strabismus, such as orthoptics, pharmacological, and behavioral interventions. | CO5 | U | 5 |
|  |  |  |  |  |  |
| 5. | a. | **Develop** a visual therapy plan for a patient with intermittent exotropia, considering the underlying A-V phenomena. | CO3 | A | 15 |
|  | b. | **List** two types of nystagmus and their associated conditions. | CO5 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | **Illustrate** three types of qualitative and quantitative tests used to diagnose strabismus and their clinical applications. | CO3 | A | 15 |
|  | b. | **Describe** the role of orthoptics in the non-surgical management of strabismus. | CO5 | R | 5 |
|  |  |  |  |  |  |
| 7. | a. | **Determine** the most appropriate treatment approach for an adult patient with amblyopia, considering their age, visual acuity, and refractive error. | CO4 | A | 15 |
|  | b. | **Illustrate** the role of vision therapy in improving binocular vision and reducing symptoms of strabismus. | CO5 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | **Illustrate** the role of behavioral and perceptual learning in the treatment of amblyopia and discuss the potential benefits of visual therapy. | CO4 | A | 15 |
|  | b. | **Estimate** the success rate of non-surgical management for two types of strabismus. | CO5 | U | 5 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | **Compare and contrast** the benefits and limitations of orthoptic techniques, pencil push-up and convergence exercises, in the treatment of accommodative esotropia. | CO6 | An | 15 |
|  | b. | **Distinguish** between the role of orthoptics in the management of congenital and acquired strabismus. | CO6 | An | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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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 treatments and analysis of amblyopia in binocular vision. |
| CO5 | Analyze various 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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | - | 30 | - | - | - | 40 |
| CO2 | - | - | 30 | - | - | - | 30 |
| CO3 | - | - | 30 | - | - | - | 30 |
| CO4 | - | - | 30 | - | - | - | 30 |
| CO5 | 10 | 20 | - | - | - | - | 30 |
| CO6 | - | - | - | 20 | - | - | 20 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define reflection. | | CO1 | R | 1 |
| 2. | Define spontaneous emission. | | CO1 | R | 1 |
| 3. | Define gauss’s law. | | CO2 | R | 1 |
| 4. | Define resistance. | | CO2 | R | 1 |
| 5. | Define absorption. | | CO3 | R | 1 |
| 6. | Define dual nature of matter. | | CO3 | R | 1 |
| 7. | Define Lenz’s law. | | CO4 | R | 1 |
| 8. | Define magnetic flux. | | CO4 | R | 1 |
| 9. | Define wave motion. | | CO5 | R | 1 |
| 10. | Define density. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain approximation in geometrical optics. | | CO1 | U | 3 |
| 12. | Describe magnetic field and magnetic forces. | | CO2 | U | 3 |
| 13. | Explain de-Broglie wave. | | CO3 | A | 3 |
| 14. | Explain eddy currents and magnetic damping. | | CO4 | U | 3 |
| 15. | Explain wave interference. | | CO5 | U | 3 |
| 16. | Explain the variation of pressure with depth in a fluid. | | 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. |  | Explain the applications of He:Ne Laser in Welding and cutting in detail. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Describe the working principle and properties of Laser. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the various sources of magnetic fields and explain their significance in electromagnetism. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain Scanning Electron microscope and X-ray diffraction analysis in detail. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain the following:  a. Electric generators  b. Back Emf  c. Induced Emf | CO4 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Describe acoustic amplitude and intensity. | CO5 | U | 6 |
|  | b. | Explain the types of mechanical waves. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 23. |  | Explain the following:  a. Archimedes’ principle  b. Bernoulli’s principle  c. Absolute pressure and pressure measurement | CO6 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the various aerospace applications of Bernoulli’s equation in detail. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **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 | Appraise the characterization ability of analytical instruments |
| CO4 | Describe the interplanetary travel in solar system |
| CO5 | Describe the characteristics of acoustic waves |
| CO6 | Demonstrate the process of obtaining nanomaterial and its applications. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 3 | 24 | - |  |  | 29 |
| CO2 | 2 | 3 | - | 12 |  |  | 17 |
| CO3 | 2 | - | 3 | 12 |  |  | 17 |
| CO4 | 2 | 15 | - | - |  |  | 17 |
| CO5 | 1 | 9 | - | 6 |  |  | 16 |
| CO6 | 1 | 12 | 3 | 12 |  |  | 28 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | |
| 1. | Sketch the energy band diagram for semiconductors. | | CO1 | A | 1 |
| 2. | List the application of photo electric effect. | | CO1 | R | 1 |
| 3. | Sketch the circuit symbol for schottky diode. | | CO2 | A | 1 |
| 4. | Define transition capacitance. | | CO2 | R | 1 |
| 5. | Indicate the unit for loudness of sound. | | CO3 | U | 1 |
| 6. | Give an example for ordered sound. | | CO3 | U | 1 |
| 7. | Define inverse piezoelectric effect. | | CO4 | R | 1 |
| 8. | Write the frequency range of ultrasonic sound waves. | | CO4 | A | 1 |
| 9. | Predict the materials used in solar cell. | | CO5 | U | 1 |
| 10. | Classify solar PV systems. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Compare homo junction with hetero junction of semiconductor. | | CO1 | U | 3 |
| 12. | State the Poisson equations. | | CO2 | R | 3 |
| 13. | Classify MOSFET. | | CO3 | U | 3 |
| 14. | Write the difference between pitch and loudness. | | CO4 | A | 3 |
| 15. | List any three properties of ultrasonic waves. | | CO5 | R | 3 |
| 16. | Label the parts of wind turbine with a neat diagram. | | 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. |  | Analyze the concept of charge conservation within a semiconductor, and derive the continuity equation for holes within an elemental semiconductor, accounting for both time and distance. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Explain in detail about the construction, working and characteristics of schottky diode. | CO2 | A | 6 |
|  | b. | Illustrate the construction and working of photo diode with neat diagram. Also state its application. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Sketch the schematic structure and explain the various modes of operation of MOS capacitor. | CO3 | A | 8 |
|  | b. | Compare MOSFET with JFET | CO3 | U | 4 |
|  |  |  |  |  |  |
| 20. | a. | Discuss the factors affecting acoustics of sound and their remedies. | CO4 | U | 8 |
|  | b. | Describe the important characteristics of musical sound. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 21. | a. | Explain the working principle of piezoelectric generator with neat diagram. | CO5 | A | 8 |
|  | b. | Explain ultrasonic cleaner. | CO5 | U | 4 |
|  |  |  |  |  |  |
| 22. |  | Classify and correlate the non-destructive testing using ultrasonics. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Enumerate and explain the main components of Tidal power plant. | CO6 | U | 8 |
|  | b. | A movie theatre has a total volume of 8000m3.The acoustics of the theatre needs to be designed to give a reverberation time of 2 seconds. Calculate the magnitude of total absorption within the theatre. | CO4 | A | 4 |
| **COMPULSORY QUESTION** | | | |
| 24. | a. | Describe in detail wind-diesel hybrid system. | CO6 | U | 6 |
|  | b. | Interpret how electric energy is harvested using solar cells. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Remember the fundamentals of semiconducting physics. |
| **CO2** | Understand the principle and operation of semiconductor junctions. |
| **CO3** | Demonstrate the MOS structures. |
| **CO4** | Analyse 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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| **CO1** | 1 | 3 | 1 | 12 | - | - | 17 |
| **CO2** | 4 | - | 13 | - | - | - | 17 |
| **CO3** | - | 9 | 8 | - | - | - | 17 |
| **CO4** | 1 | 12 | 8 | - | - | - | 21 |
| **CO5** | 3 | 5 | 8 | 12 | - | - | 28 |
| **CO6** | 3 | 15 | 6 | - | - | - | 24 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | The quantity Δp/Δt is represented as \_\_\_ \_\_\_\_ | | CO1 | U | 1 |
| 2. | Define impulse. | | CO1 | R | 1 |
| 3. | Calculate the work done if the force F and displacement S are perpendicular. | | CO2 | E | 1 |
| 4. | Moment of force is otherwise called as \_\_\_\_\_ | | CO2 | R | 1 |
| 5. | Name the two components where the force on a rigid body capable of rotating. | | CO3 | U | 1 |
| 6. | Classify the modulus of elasticity. | | CO3 | U | 1 |
| 7. | State Snell’s law. | | CO4 | R | 1 |
| 8. | State the condition for Stimulated emission in lasers. | | CO4 | U | 1 |
| 9. | Define refractive index. | | CO5 | U | 1 |
| 10. | Define monochromatic property of laser. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | State the impulse momentum theory, the relation and the units. | | CO1 | U | 3 |
| 12. | A 250 g bullet travelling at 100 m/s strikes a metal bar and penetrates 10 mm before coming to rest. Calculate its kinetic energy. | | CO2 | E | 3 |
| 13. | Write the formula for calculating the time period of torsional oscillations. | | CO3 | U | 3 |
| 14. | Write the formula to find the angular momentum about a point O. | | CO4 | A | 3 |
| 15. | Justify the importance of metastable state in laser emission. | | CO5 | E | 3 |
| 16. | Define numerical aperture in fiber optic communication. | | CO6 | 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. |  | An electron of mass 9.1 x 10-31 kg with speed 4 x 103 m/s passes through an electric field for 2 x 10-7 s and emerges with a speed of 5 x 105 m/s. Calculate i) initial momentum, ii) The final momentum, iii) the impulse and iv) the rate of change of momentum. | CO1 | E | 12 |
|  |  |  |  |  |  |
| 18. |  | Experiment with a piece of block to calculate the work done if the force applied is i) parallel, ii) F & S are parallel and angle is 0, iii) F & S are perpendicular and iv) F is applied opposite to S. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 19. | a. | Experiment with a thin wire to find moment of inertia and rigidity modulus. | CO2 | An | 8 |
|  | b. | Compare the three moduli of elasticity. | CO2 | An | 4 |
|  |  |  |  |  |  |
| 20. |  | Determine the following key features of linear harmonic oscillator  i) Hooke’s law ii) Equation of motion. iii) Period and frequency iv) Total mechanical energy | CO2 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | A force making an angle with the horizontal is pulling a block of mass M to the right. The other forces acting are the reaction force N, the force of gravity W on the mass M, and the frictional force f, and the coefficient of friction μ. If the block moves through a distance x, calculate the work done by different forces if M= 10kg, θ=30o, F=100N, g=9.8 m/s2 x=2 cm and μ= 0.2. | CO3 | E | 12 |
|  |  |  |  |  |  |
| 22. | a. | Write short notes on i) Optical pumping ii) Stimulated emission and  iii) Coherence. | CO5 | A | 9 |
|  | b. | Classify the types of lasers based on the material of the active medium. | CO5 | An | 3 |
|  |  |  |  |  |  |
| 23. | a. | Describe the laser emission through absorption, spontaneous emission and stimulated emission of radiation with suitable diagrams. | CO5 | A | 8 |
|  | b. | Construct a holographic image through lensless photography. | CO5 | An | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Determine the numerical aperture of an optical fiber and the number of modes that can pass through it. | CO6 | E | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Apply Newtonian Mechanics to solve kinematic problems. |
| **CO2** | Solve the problems based on modulus of elasticity. |
| **CO3** | Analyze rigid body mechanics using transformations. |
| **CO4** | Apply the fundamentals laws concerning Oscillations at different planes. |
| **CO5** | Discuss about the concepts of lasers and its applications. |
| **CO6** | Relate the application of fibre optics in optic devices. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| **CO1** | 1 | 4 |  | 12 | 12 |  | 29 |
| **CO2** | 1 |  |  | 24 | 4 |  | 29 |
| **CO3** |  | 5 |  |  | 12 |  | 17 |
| **CO4** | 1 | 1 | 3 |  |  |  | 5 |
| **CO5** |  | 1 | 17 | 7 | 3 |  | 28 |
| **CO6** |  | 4 |  |  | 12 |  | 16 |
|  | | | | | | | **124** |

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | | **BL** | | **M** | |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | | | | |
| 1. | State the nature of laser light emission. | | CO1 | | R | | 1 | |
| 2. | Explain the term “Stimulated Absorption”. | | CO1 | | U | | 1 | |
| 3. | State the basic principle of optical fiber cable. | | CO2 | | R | | 1 | |
| 4. | Define skew rays briefly. | | CO2 | | U | | 1 | |
| 5. | Name the types of sound waves based on frequency. | | CO3 | | R | | 1 | |
| 6. | Explain the magnetostriction effect. | | CO3 | | U | | 1 | |
| 7. | State the nature of sound waves. | | CO4 | | R | | 1 | |
| 8. | State the effect that can occur in an auditorium when the reverberation time becomes zero. | | CO4 | | U | | 1 | |
| 9. | Explain the effect of a magnetic field on paramagnetic materials. | | CO5 | | R | | 1 | |
| 10. | Discuss the properties of soft magnetic materials. | | CO5 | | U | | 1 | |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | | | | |
| 11. | Infer the wavelength of emission from a semiconductor laser given that the band gap energy is 3 eV. | | CO1 | | U | | 3 | |
| 12. | Calculate the numerical aperture of a step index single mode optical fiber cable in which the refractive index of the core is 1.456 and the refractive index of cladding is 1.439. | | CO2 | | A | | 3 | |
| 13. | Estimate the first excited frequency of a pure iron rod with a length of 40 mm. The density of pure iron is 7250 kg/m3 and its Young’s modulus value is 11.5 x 1010 N/m2. | | CO3 | | U | | 3 | |
| 14. | Calculate the intensity level of heavy traffic, which has an intensity of 1 W/m2. [The standard intensity = 10-12 W/m2.] | | CO4 | | A | | 3 | |
| 15. | A magnetic field of 3600 amperes/meter produces a magnetic flux density of 3 Wb/m2. Calculate the permeability. | | 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. |  | Establish the existence of stimulated emission of radiation with the help of Einstein’s quantum theory of radiation. | | CO1 | | A | | 12 |
|  |  |  | |  | |  | |  |
| 18. |  | Classify the optical fiber cables based on the materials used for manufacturing and the modes of transmission of light and explain each type in detail. | | CO2 | | An | | 12 |
|  |  |  | |  | |  | |  |
| 19. |  | Explain the method of producing ultrasonic waves using the inverse piezoelectric effect, with a circuit diagram. | | CO3 | | A | | 12 |
|  |  |  | |  | |  | |  |
| 20. |  | Analyze four factors that affect the acoustics of a good auditorium and suggest remedial measures for each. | | CO4 | | An | | 12 |
|  |  |  | |  | |  | |  |
| 21. |  | Compare and contrast **diamagnetic, paramagnetic**, and **ferromagnetic** materials. | | CO5 | | An | | 12 |
|  |  |  | |  | |  | |  |
| 22. | a. | List the methods of achieving population inversion and explain any one of them in detail. | | CO1 | | R | | 6 |
|  | b. | Define the terms numerical aperture and acceptance angle with proper equation and a diagram respectively. | | CO2 | | R | | 6 |
|  |  |  | |  | |  | |  |
| 23. | a. | Define the following effects briefly:  Magnetostriction effect and piezoelectric effect. | | CO3 | | U | | 6 |
|  | b. | Name the characteristics of musical sound and describe one of them briefly. | | CO4 | | U | | 6 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. |  | Superconductors are a unique class of materials that are classified into two categories. Describe the classification of superconductors in detail. | | CO6 | | R | | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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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 / BL** | **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** | 12 | --- | 3 | --- | --- | --- | **15** |
|  | | | | | | | **124** |

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify one method used in material selection. | | CO1 | U | 1 |
| 2. | Define co-ordination number. | | CO1 | R | 1 |
| 3. | Name few non-ferrous alloys. | | CO2 | R | 1 |
| 4. | Explain the “yield point phenomenon”. | | CO2 | U | 1 |
| 5. | Give an example of a glass ceramic. | | CO3 | R | 1 |
| 6. | Describe the structure of crystalline ceramics. | | CO3 | U | 1 |
| 7. | Mention a few applications of composites in aerospace. | | CO4 | U | 1 |
| 8. | Explain the role of fiber reinforcement in composite materials. | | CO4 | U | 1 |
| 9. | Give an example of a thermal insulator. | | CO5 | U | 1 |
| 10. | List an example of oxidation-resistant material. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Differentiate between crystalline and amorphous solids. | | CO1 | An | 3 |
| 12. | Describe the role of grain refinement in metal strengthening. | | CO2 | A | 3 |
| 13. | Discuss different types of ceramics and their respective applications. | | CO3 | U | 3 |
| 14. | Differentiate between polymer and ceramic matrix composites. | | CO4 | A | 3 |
| 15. | Describe the characteristics of tool and die materials. | | CO5 | A | 3 |
| 16. | Explain the mechanism of wet 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. | Analyze the impact of atomic structure on the physical properties of materials. | CO1 | An | 6 |
| b. | Compare different types of bonds in solids and their effects on material properties. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. | a. | Describe the mechanisms of deformation in metals and the impact of crystal imperfections. | CO2 | An | 6 |
| b. | Discuss the iron-carbon equilibrium diagram and its relevance to metallurgical properties. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the applications and manufacturing process of glass ceramics. | CO3 | A | 6 |
| b. | Analyze the stress-strain behavior in ceramics and how it differs from metals. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 20. | a. | Describe the manufacturing processes for fiber-reinforced composites. | CO4 | A | 6 |
| b. | Analyze the types of composite materials and their suitability for structural applications. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Compare the properties of different refractory metals. | CO5 | A | 6 |
| b. | Analyze the factors influencing the choice of materials for bearings. | CO5 | An | 6 |
|  |  |  |  |  |  |
| 22. | a. | Explain the process of strengthening metals through heat treatment. | CO2 | An | 6 |
| b. | Describe the classification of engineering materials with examples. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Describe the manufacturing processes for particle-reinforced metal matrix composites. | CO4 | A | 8 |
| b. | Discuss the role of advanced ceramics in modern industries. | CO3 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Analyze the factors influencing corrosion in marine concrete and prevention techniques. | CO6 | An | 8 |
| b. | Explain the mechanisms of electrochemical corrosion process. | CO6 | A | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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| --- | --- |
|  | **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** | Demonstrate use of 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 Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| **CO1** | 1 | 7 | 6 | 9 | - | - | 23 |
| **CO2** | 1 | 1 | 3 | 18 | - | - | 23 |
| **CO3** | 1 | 8 | 6 | 6 | - | - | 21 |
| **CO4** | - | 2 | 17 | 6 | - | - | 25 |
| **CO5** | - | 1 | 9 | 6 | - | - | 16 |
| **CO6** | - | 1 | 7 | 8 | - | - | 16 |
|  | | | | | | | **124** |

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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| --- | --- | --- | --- |
| **Course Code** | **20PH3014** | **Duration** | **3hrs** |
| **Course Title** | **FABRICATION AND TESTING OF THIN FILM DEVICES** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Determine the role of turbomolecular pumps in a vacuum system for semiconductor manufacturing. | CO1 | A | 16 |
|  | b. | List the advantages and disadvantages of turbomolecular pump. | CO1 | R | 4 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Distinguish between Pirani and Penning gauges with a neat sketch, focussing on their operating principle and measurement ranges. | CO1 | An | 16 |
|  | b. | List the advantages and disadvantages of Pirani and Penning gauges. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 3. |  | Explain the construction and working principle of Pulsed Laser Deposition (PLD) with a suitable sketch. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Appraise the deposition of metal oxide semiconductors using Molecular Beam Epitaxy (MBE). | CO2 | E | 20 |
|  |  |  |  |  |  |
| 5. |  | Compare the different types of interfaces in thin films with suitable sketches. | CO3 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Illustrate the construction and working principle of X-ray Diffraction with a neat sketch. | CO4 | U | 15 |
|  | b. | Define the following terms related to the determination of structural parameters in thin films.   1. Crystal structure 2. Lattice parameter 3. Microstrain 4. Dislocation density 5. Cell volume | CO4 | R | 5 |
|  |  |  |  |  |  |
| 7. | a. | Analyze the advantages and limitations of using UV-Vis-NIR spectroscopy for determining the bandgap of thin films, and compare it with other methods of bandgap determination. | CO4 | An | 15 |
|  | b. | Choose a suitable technique from the below list to perform the qualitative identification/analysis of the oxygen vacancy present in the given metal oxide thin film. Justify your answer.  1. X-ray Diffraction studies  2. Photoluminescence (PL) studies  3. Scanning Electron Microscopy | CO4 | E | 5 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Evaluate the advantages and limitations of using the Hall effect technique for identifying the types of charge carriers compared to other methods. Justify your assessment with relevant examples. | CO5 | E | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Apply your understanding of multilayer solar cells by sketching one and demonstrating how each layer contributes to the overall efficiency. Provide examples of materials that can be used in each layer and discuss how their properties enhance performance. | CO6 | A | 10 |
|  | b. | Analyze the structure of the given CNT-based thin film transistor and explain the role of each layer. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the vacuum pumps and measure the vacuum level |
| CO2 | Illustrate the mechanism of thin film deposition |
| CO3 | Apply the knowledge on the influence of substrates on the growth of thin films |
| CO4 | Analyse the thin film characteristics through different tools |
| CO5 | Appraise the latest thin film device fabrication and testing |
| CO6 | Create fabrication methods for thin film-based devices like solar cells and gas sensors |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 |  | 16 | 16 |  |  | 40 |
| CO2 |  | 20 |  |  | 20 |  | 40 |
| CO3 |  |  |  |  | 20 |  | 20 |
| CO4 | 5 | 15 |  | 15 | 5 |  | 40 |
| CO5 |  |  |  |  | 20 |  | 20 |
| CO6 |  |  | 10 | 10 |  |  | 20 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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| --- | --- | --- | --- |
| **Course Code** | **23PH1001** | **Duration** | **3hrs** |
| **Course Title** | **APPLIED PHYSICS FOR AEROSPACE ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Define LASER photonics. | | CO1 | R | 1 |
| 2. | List the properties of LASER. | | CO1 | R | 1 |
| 3. | Define refractive index. | | CO2 | R | 1 |
| 4. | Define total internal reflection. | | CO2 | R | 1 |
| 5. | Define aero-acoustics. | | CO3 | R | 1 |
| 6. | List the different classification of sound. | | CO3 | R | 1 |
| 7. | State the properties of ultrasonic waves. | | CO4 | R | 1 |
| 8. | Define the frequency range of ultrasonic waves. | | CO4 | R | 1 |
| 9. | List the types of magnetic materials. | | CO5 | R | 1 |
| 10. | Define asteroids | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Explain LASER cleaning of materials. | | CO1 | A | 3 |
| 12. | Explain acceptance angle and numerical aperture. | | CO2 | An | 3 |
| 13. | Explain the characteristics of musical sound. | | CO3 | U | 3 |
| 14. | Explain ultrasonic testing of composite materials. | | CO4 | A | 3 |
| 15. | Explain the different types of magnetic materials | | CO5 | U | 3 |
| 16. | Explain Kepler’s three laws of planetary motion. | | CO6 | 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. |  | Explain the application of LASER enabled additive manufacturing for space exploration. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 18. |  | With neat sketch, explain the principle and components of LASER and explain its application in aerospace industry. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Describe the principle of optical fibers and its application in aircraft/aerospace industry. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Calculate the reverberation time for an auditorium measuring 30 m X 15 m X 6m. Sound absorption coefficient for walls = 0.03, for ceiling =0.36 and for floor = 0.26. | CO3 | An | 9 |
|  | b. | Explain the concept of reverberation time. | CO3 | U | 3 |
|  |  |  |  |  |  |
| 21. |  | Explain the aerospace industry applications of ultrasonic testing. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the applications of sensors and actuators in aerospace industry. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain in detail about interplanetary space travel. | CO6 | An | 9 |
|  | b. | Explain about space stations. | CO6 | U | 3 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain about our solar system with a neat sketch. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic working principle of lasers and apply the same in novel applications in the aerospace industry. |
| CO2 | Construct applications based on optical fiber technology in evaluating aeronautical systems. |
| CO3 | Investigate the structural integrity of materials using acoustical phenomena. |
| CO4 | Apply the non-destructive testing methods using ultrasound waves for testing various components in the aerospace industry. |
| CO5 | Analyze the importance of novel magnetic materials and their applications in sensors and actuators used in aerospace systems. |
| CO6 | Distinguish between the various solar system models, earth’s immediate cosmic neighborhood, and other constituents of the solar system. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 12 | 15 | - | - | - | 29 |
| CO2 | 2 | 12 | - | 3 | - | - | 17 |
| CO3 | 2 | 6 | - | 9 | - | - | 17 |
| CO4 | 2 | - | 3 | 12 | - | - | 17 |
| CO5 | 1 | 3 | - | 12 | - | - | 16 |
| CO6 | 1 | 6 | 12 | 9 | - | - | 28 |
|  | | | | | | | **124** |

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Mention the quantum state of the graphene sheet nanoparticle. | | CO1 | U | 1 |
| 2. | State the nature of energy according to Planck’s hypothesis. | | CO1 | R | 1 |
| 3. | Name the shift happens in the optical property due to a decrease in the size of a material. | | CO2 | An | 1 |
| 4. | Aspect ratio becomes\_\_\_\_\_\_ due to size reduction of materials to nanoscale. | | CO2 | A | 1 |
| 5. | The \_\_\_\_\_\_ energy equation defines surface energy of nanomaterials. | | CO3 | U | 1 |
| 6. | Mention the electrical property of the armchair type carbon nanotube | | CO3 | U | 1 |
| 7. | Gold nanoparticle exhibits \_\_\_\_\_\_electrical property in its potential graph | | CO4 | An | 1 |
| 8. | Nanomaterials exhibit \_\_\_\_\_\_\_ magnetic property | | CO4 | An | 1 |
| 9. | Mention the efficiency formula of a solar cell. | | CO5 | U | 1 |
| 10. | Cite an example of alternate materials used in secondary batteries instead of Li-ion | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Illustrate the Bohr exciton radius with a schematic. | | CO1 | An | 3 |
| 12. | Define a quantum wire. | | CO2 | U | 3 |
| 13. | Describe the change in bandgap due to size reduction. | | CO3 | An | 3 |
| 14. | Analyze the change in the colour of gold due to size reduction to various dimensions. | | CO4 | An | 3 |
| 15. | Draw the hysteresis loop showing the coercive field and remanence | | CO5 | An | 3 |
| 16. | Describe the giant magnetoresistance phenomena | | CO6 | 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. | Distinguish the quantum states of nanomaterials upon three different dimensional reductions in size. | CO1 | An | 10 |
|  | b. | Explain the pilot wave of an electron in quantum mechanics. | CO1 | U | 2 |
|  |  |  |  |  |  |
| 18. |  | Illustrate the three fundamental quantum mechanical postulates with relevant schematic. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Analyze the UV-Vis spectrophotograph of nanomaterials and the absorption edge shift. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Examine the mechanical properties of nanomaterials with suitable diagrams. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Experiment with gold nanoparticles to obtain electrical properties and plot the conductance graph. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Demonstrate the domain growth and domain rotation in the magnetic properties of nanomaterials with neat schematic. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Determine the efficiency of a quantum dot solar cell using full spectrum absorption. | CO5 | E | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Classify the energy storage devices and the alternative materials for secondary batteries. | CO6 | U | 4 |
|  | b. | Describe the mechanism of charging and discharging in Li-ion batteries. | CO6 | U | 8 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Classify the quantum states upon size reduction to nanoscale. |
| **CO2** | Distinguish the physical properties of bulk and nanomaterials. |
| **CO3** | Analyse the structural and optical properties of nanomaterials. |
| **CO4** | Analyse the magnetic and electrical properties of Nanomaterials. |
| **CO5** | Demonstrate the working of Li-ion battery. |
| **CO6** | Design supercapacitors using nanomaterials. |

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

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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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| --- | --- | --- | --- |
| **Course Code** | **23PH3014** | **Duration** | **3hrs** |
| **Course Title** | **THIN FILM TECHNOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Classify the vacuum pumps based on pumping mechanism. | CO1 | U | 5 |
|  | b. | Analyze the advantages and disadvantages of turbo molecular pump with suitable working principle. | CO1 | AN | 15 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Illustrate the modified Wheatstone bridge circuit to demonstrate working of Pirani gauge. | CO1 | A | 12 |
|  | b. | Demonstrate the working of capacitance diaphragm gauge with a neat diagram. | CO1 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Experiment with pulsed laser deposition technique to develop a composite thin film. | CO2 | An | 8 |
|  | b. | Distinguish the magnetron and radiofrequency sputtering techniques with suitable diagrams. | CO2 | An | 12 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Experiment with molecular beam epitaxial system to deposit composite films. | CO2 | An | 8 |
|  | b. | Apply spray pyrolysis method to prepare a thin film gas sensor with a relevant physisorption material. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 5. | a. | Illustrate the adsorption and diffusion processes in thin film deposition. | CO3 | U | 10 |
|  | b. | Explain how the substrate cleaning process aids for effective adherence and growth of thin films. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Justify the influence of substrate material properties alters the quality of thin films. | CO3 | E | 10 |
|  | b. | Define lattice mismatch and stress developments during the thin film deposition process. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. |  | Determine the electrical properties of thin films using hall measurements. | CO4 | E | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Justify the optical absorption and transmittance graph help in interpreting the band gap, absorption coefficient and transmittance properties of thin films. | CO4 | E | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Design a multilayer thin film solar cell and justify how it would absorb full solar spectrum. | CO6 | C | 10 |
|  | b | Design a carbon nanotube-based transistor and plot the current voltage characteristics. | CO6 | C | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| CO1 | Define Quantum confinement effect in nanomaterials. |
| CO2 | Describe the different fabrication techniques of nanomaterials. |
| CO3 | Examine the characteristics of nanomaterials. |
| CO4 | Analyse the nanodevices with different characterization tools. |
| CO5 | Evaluate the nanodevices for different applications. |
| CO6 | Design and create advanced nanodevices. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 13 | 12 | 15 |  |  | 40 |
| CO2 |  |  | 12 | 28 |  |  | 40 |
| CO3 |  | 30 |  |  | 10 |  | 40 |
| CO4 |  |  |  |  | 40 |  | 40 |
| CO5 |  |  |  |  |  |  |  |
| CO6 |  |  |  |  |  | 20 | 20 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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| **Course Code** | **23PH3022** | **Duration** | **3hrs** |
| **Course Title** | **MATERIAL CHARACTERIZATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Describe the fundamental working principle of AFM and explain the key components of an AFM system, such as the scanner, detector, and control electronics. | CO1 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Explain the fundamental principles of X-ray diffraction, including Bragg's Law and the concept of d-spacing. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 3. |  | Illustrate X-ray Photoelectron Spectroscopy with a neat sketch, and explain its instrumentation and working principles in detail. | CO2 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain the working principle of SEM, the generation of electron beams, interaction with the sample, and the formation of secondary and backscattered electron images. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. |  | Describe the working principle of TEM, including the generation of electron beams, interaction with the sample, and image formation in detail. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Compare and contrast the principles and workings of Thermogravimetric Analysis (TGA) and Differential Thermal Analysis (DTA) methods in analyzing the weight loss and decomposition of sample materials. | CO4 | An | 20 |
|  |  |  |  |  |  |
| 7. |  | Differentiate LC and GC in terms of their basic principles and applications. Also, discuss the challenges in analyzing complex mixtures and trace analytes. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Explain the working principle of the two-probe method and discuss the limitations of the two-probe method in terms of contact resistance. | CO5 | An | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain the fundamental principle of indentation hardness testing and analyze the geometry of the Vickers indenter and its significance in hardness measurement. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Identify suitable techniques for specific materials characterization. |
| CO2 | Apply knowledge and skills in utilizing diverse instrumentations to scan and test materials assessing their properties. |
| CO3 | Examine the structural and compositional properties of materials using XRD, SEM, XPS, EDAX and AFM |
| CO4 | Understand microscopic and macroscopic property analysis for various materials. |
| CO5 | Analyze the magnetic properties of materials and functions. |
| CO6 | Recognize and select appropriate tests for analyzing the thermal properties of materials. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  |  |  | 20 |
| CO2 |  |  | 20 | 20 |  |  | 40 |
| CO3 |  |  | 20 | 20 |  |  | 40 |
| CO4 |  |  | 20 | 20 |  |  | 40 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  |  | 20 |  |  |  | 20 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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| **Course Code** | **23PH3036** | **Duration** | **3hrs** |
| **Course Title** | **BIOMATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Explain the types and properties of various nano-biomaterials in detail, and compare their properties with those of nano-ceramics. | CO1 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Illustrate carbon-based nano-biomaterials in detail, and discuss their various biomedical applications. | CO1 | An | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss the critical role of biomaterials in the development of orthopedic and dental implants, highlighting the advantages and limitations of commonly used materials such as titanium alloys and ceramics. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Explain various types of polymer materials in detail, and compare and contrast natural and synthetic polymers in terms of their usage in medical applications. | CO3 | A | 20 |
|  |  |  |  |  |  |
| 5. |  | Elucidate various biopolymers and their properties in detail, and discuss their biological applications. | CO3 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Illustrate bio-ceramics and their common types in detail. | CO4 | A | 10 |
|  |  | Explain composite implant materials in detail, and analyze their applications in the medical industry. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. |  | Explain smart materials in detail, and analyze their applications in drug delivery and tissue engineering. | CO4 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Compare and contrast biocompatibility, blood compatibility, and tissue compatibility in terms of biomaterials used in medical applications. | CO5 | An | 20 |
| **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain the importance of in vitro and in vivo testing in the development and evaluation of biomaterials for medical applications. Hhighlight the challenges associated with both the testings. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Examine various kinds of bulk and nano biomaterials properties |
| CO2 | Explain the concepts of metallic implant materials and their properties in detail |
| CO3 | Summarize the fundamental ideas of polymeric implant materials in the human body and their effectiveness |
| CO4 | Categorize ceramic implant material and their applications in biomedical areas. |
| CO5 | Illustrate smart biomaterials and their importance in medical applications |
| CO6 | Apply the biocompatibility phenomenon in human tissues and interpret their applications. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 20 | 20 |  |  | 40 |
| CO2 |  |  | 20 |  |  |  | 20 |
| CO3 |  |  | 20 | 20 |  |  | 40 |
| CO4 |  |  | 30 | 10 |  |  | 40 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  |  | 20 |  |  |  | 20 |
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**END SEMESTER EXAMINATION – NOV / DEC 2024**

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| --- | --- | --- | --- |
| **Course Code** | **24PH1001** | **Duration** | **3hrs** |
| **Course Title** | **APPLIED PHYSICS FOR BIOTECHNOLOGY ENGINEERING** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the condition to achieve population inversion. | | CO1 | U | 1 |
| 2. | Mention the ratio of helium and neon in He:Ne laser. | | CO1 | R | 1 |
| 3. | Name two different refractive index parts of an optical fiber cable. | | CO2 | R | 1 |
| 4. | In order to achieve total internal reflection, the incident ray must be greater than ………… angle. | | CO2 | R | 1 |
| 5. | The sound waves below 20 Hz are called as ……… | | CO3 | U | 1 |
| 6. | Lamb waves are also called as ……… | | CO3 | R | 1 |
| 7. | Mention two characteristics of the ‘noise’ in acoustics. | | CO4 | U | 1 |
| 8. | Define timbre. | | CO4 | R | 1 |
| 9. | Illustrate a dipole. | | CO5 | U | 1 |
| 10. | MRI stands for ………. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe the process of stimulated emission. | | CO1 | An | 3 |
| 12. | Classify optical fiber cables based on the number of modes. | | CO2 | U | 3 |
| 13. | Distinguish ultrasonic waves based on their mode of vibration. | | CO3 | An | 3 |
| 14. | Explain the factors controlling reverberation time. | | CO4 | U | 3 |
| 15. | Distinguish hard and soft magnetic materials and their properties. | | CO5 | An | 3 |
| 16. | Classify the materials based on their dimensions. | | CO6 | 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. |  | Explain the principle, construction and working of a He:Ne laser with its energy level diagram. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. | a. | Define the terms numerical aperture and acceptance angle in optical fiber. | CO2 | U | 4 |
|  | b. | Describe the different types of attenuation in optical fiber cables. | CO2 | A | 8 |
|  |  |  |  |  |  |
| 19. | a. | Describe piezoelectric crystal and the types of their axes with diagram. | CO3 | A | 4 |
|  | b. | Experiment with a piezoelectric oscillator to produce ultrasonic waves. | CO3 | An | 8 |
|  |  |  |  |  |  |
| 20. |  | Assess the various factors affecting the architectural acoustics of a building and the remedial measures. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 21. | a. | Differentiate hard and soft magnetic materials based on their properties. | CO5 | U | 4 |
|  | b. | Compare properties of diamagnetic, paramagnetic and ferromagnetic materials. | CO5 | E | 8 |
|  |  |  |  |  |  |
| 22. |  | Apply the magnetostriction oscillator to produce ultrasonic waves with necessary circuit diagram. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 23 |  | Analyze the hysteresis curve between magnetic flux density and the magnetizing field strength for a ferromagnetic material. | CO5 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Define quantum wire and its properties. | CO6 | A | 4 |
|  | b. | Analyze the magnetic properties of a nanomaterial and compare it with the bulk material. | CO6 | An | 8 |

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Understand the importance of lasers in biotechnology related industries. |
| CO2 | Illustrate the principle of fiber optics in endoscopy and fiber optic sensors. |
| CO3 | Apply the concepts of ultrasound and its applications in biotechnology industry. |
| CO4 | Discern the laws governing acoustics in bioacoustics and plant acoustics. |
| CO5 | Analyze the concepts of magnetism in MRI and magnetic drug delivery. |
| CO6 | Evaluate the various properties of nanomaterials for usage in biotechnology. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| **CO / BL** | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 1 |  | 15 |  |  | 17 |
| CO2 | 2 | 7 | 8 |  |  |  | 17 |
| CO3 | 1 | 1 | 4 | 23 |  |  | 29 |
| CO4 | 1 | 4 |  |  | 12 |  | 17 |
| CO5 |  | 5 |  | 15 | 8 |  | 28 |
| CO6 |  | 4 | 4 | 8 |  |  | 16 |
|  | | | | | | | **124** |