D–1585

Sub. Code
34511

DISTANCE EDUCATION

M.Sc DEGREE EXAMINATION, DECEMBER 2021.

First Semester

Physics

CLASSICAL MECHANICS

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is meant by constraints?
2. Define cyclic coordinates.
3. State - Keplar's law of planetary motion.
4. Define Phase - Space.
5. Write a note on Poisson bracket.
6. What is the product of inertia?
7. What is time - dilation?
8. State the postulates of special theory of relativity.
9. What is meant by normal modes?
10. Write the secular equation for small oscillations.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL the questions, choosing either (a) or (b).

11. (a) What are the different dynamical system - Explain.

Or

(b) Define Routhian function. Explain.

12. (a) Discuss the theory on Calculas of variation.

Or

(b) Derive the time independent Hamilton - Jacobi equation.

13. (a) Write a note on momental ellipsoid.

Or

(b) Derive Lorentz transformation equation.

14. (a) What is length contraction? Explain.

Or

(b) Describe about the angular momentum of the rigid body.

15. (a) Discuss the theory on one dimensional oscillator using small oscillation.

Or

(b) Write a short note on :

(i) Normal coordinates

(ii) Normal modes.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Define D'Alembert's Principle. Deduce the Lagrangian equation for general system.

17. Derive Hamilton's Canonical equation.

18. Derive Liouville's theorem for change of density distribution with time and show that the density of points is conserved.

19. Derive the kinetic energy of a rigid body rotating about a fixed point.

20. Describe the two coupled oscillators experiment. Obtain the equation of motion.

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D–1586

Sub. Code
34512

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

First Semester

Physics

MATHEMATICAL PHYSICS -I

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define gradient of scalar point function.

2. What is line integral?

3. What is singular matrix?

4. If $A = \begin{bmatrix} 1 & 1 \\ -2 & 1 \end{bmatrix}$ then find Adj A.

5. Mention any two properties of matrix multiplication.

6. Prove that $J_{\frac{1}{2}}(x) = \sqrt{\left(\frac{2}{\pi x}\sin x\right)}$

7. Define beta function.

8. Mention the generating function of Hermite polynomial.

9. Find the Laplace transform of $f(t) = \sin h(at)$

10. Write the Fourier sine integral of $f(x)$.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Show that the vectors $(5\vec{a} + 6\vec{b} + 7\vec{c}), (7\vec{a} - 8\vec{b} + 9\vec{c})$ and $(3\vec{a} + 20\vec{b} + 5\vec{c})$ are coplanar, $\vec{a}, \vec{b}, \vec{c}$ being three non-collinear vectors.

Or

(b) If $\phi = 3x^2y - y^3z^2$, find grad ϕ at the point $(1,-2,-1)$.

12. (a) Find the eigen values of the matrix.

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

Or

(b) Find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 2 \\ 2 & -1 & 3 & 2 \\ 3 & -5 & 2 & 2 \\ 6 & -3 & 8 & 6 \end{bmatrix}$

13. (a) Prove that $\beta_{(m,n)} = \dfrac{\lceil m \lceil n}{\lceil m+n}$

Or

(b) Prove that $H_n'(x) = 2n\, H_{n-1}(x)$

14. (a) Obtain the generating function of Bessel's differential equation.

Or

(b) Prove that $np_n(x) = xp_n'(x) - p_{n-1}'(x)$.

15. (a) State and prove convolution theorem of laplace transform.

Or

(b) Find the fourier sine transform of $f(x) = \dfrac{e^{-ax}}{x}$.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. State and prove the stoke's theorem.

17. Find the diagonal matrix for the given matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.

18. Obtain the general solution for legendre's differential equation.

19. State and prove the orthogonality theorem of laguerre function.

20. Find the laplace transform of

(a) $f(t) = \int_0^t \frac{\sin at}{t}\, dt$

(b) $f(t) = \frac{e^{at} - \cos bt}{t}$.

D–1587

Sub. Code
34513

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

First Semester

Physics

LINEAR AND INTEGRATED ELECTRONICS

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What is meant by a hole?
2. Sketch the symbol of P.N. junction diode with reverse bias and describe the operation.
3. What are tunnel diode?
4. Give circuit representation for two types of transistors.
5. Why one need to fix the operation point?
6. Define stability factor.
7. Mention the advantages of voltage divider bias circuit.
8. Describe operation of FET.
9. State CMRR.
10. Switch the circuit diagram of integrator.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Explain the concept of PN junction.

Or

(b) Define Schottky effect. Explain the operation of Schottky diode.

12. (a) Explain the common emitter configuration of transistor.

Or

(b) What is the need for biasing and illustrates DC load line analysis.

13. (a) Describe the operation silicon controlled rectifier.

Or

(b) Draw circuit diagram of photodetector and explain its working.

14. (a) Construct and explain Hartley oscillator using transistor.

Or

(b) What are solar cells? Explain its characteristics.

15. (a) Define the following :

(i) Input offset voltage

(ii) Differential input resistance

Or

(b) Construct adder circuit with help of Op-Amp and explain its operation.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the construction, working and application of zener diode.

17. Discuss the working of class B pushbull amplifier with circuit diagram.

18. Explain construction, working and characteristic of MOSFET.

19. Explain the following applications of Op-Amp

    (a) inverting

    (b) non-inverting

    (c) comparator

20. What are active filters? Construct low pass and high pass filter using Op-Amp. Explain their operation.

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D–1588

Sub. Code
34521

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

Second Semester

Physics

QUANTUM MECHANICS – I

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What are matter waves?
2. State Ehrenfest's theorem.
3. Differentiate free particle and bound particle.
4. Define degeneracy of a state. Give the total degeneracy of Hydrogen like atom.
5. List any two properties of creation operator.
6. Classify the types of representations that are used in different situations with respect to time evolution.
7. Mention the principle of WKB approximation.
8. Define Rayleigh ratio.
9. Give the expression for Fermi Golden rule.
10. Distinguish between spontaneous and stimulated emissions.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Derive time independent Schrodinger wave equation.

Or

(b) Explain the eigen function and eigen vectors.

12. (a) Derive the quantised energy levels of rigid rotator.

Or

(b) Show that the energy eigen value of a particle entrapped in a one dimensional box of length $2a$ is given by $E_n = \frac{n^2\pi^2\hbar^2}{8ma^2}$.

13. (a) Explain Dirac's bra and Ket notations.

Or

(b) Write about time independent perturbation theory.

14. (a) Apply WkB method to obtain the quantisation condition for a bound states.

Or

(b) Write notes on the selection rule of time dependent perturbation theory.

15. (a) Discuss the semi classical theory of radiation.

Or

(b) Derive the relation between Einstein's A and B coefficients for transition probability.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the postulates of quantum mechanics.

17. Write short notes on:

    (a) Tunnel effect. (5)

    (b) Free particle. (5)

18. Give the salient feature of Schrodinger and Interaction pictures.

19. Explain the effect of electric field on the ground state of hydrogen atom.

20. Discuss the theory of Raman scattering.

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D–1589	Sub. Code
	34522

DISTANCE EDUCATION

M.Sc.(Physics) DEGREE EXAMINATION, DECEMBER 2021.

Second Semester

MATHEMATICAL PHYSICS–II

(CBCS 2018 – 19 Academic Year Onwards)

Time : 3 hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define Cauchy–Riemann condition.

2. What is singularities?

3. Write down the one heat flow equation.

4. What do you mean by Cartesian Tensors?

5. Define Metric tensors.

6. What is group? Give example.

7. Define character tables in group.

8. Define symmetry operators.

9. What is conditional probability.

10. What is binomial distribution?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Explain about Laurent series Expansion.

Or

(b) Prove by contour integration method $\int_0^{2\pi} \frac{d\theta}{1 + \sin^2 \theta}$.

12. (a) Solve Laplace's equation in Cartesian coordinates by method of separation of variables.

Or

(b) Find the Green's function for $L(u) = u^{11} + k^2 u$. With the boundary condition $u(0) = u(1) = 0$.

13. (a) Determine metric tensor in

(i) spherical coordinates and

(ii) cylindrical coordinates.

Or

(b) State and prove that outer product and inner product of two tensor.

14. (a) What is cyclic group? Explain about the group multiplication table.

Or

(b) Define Representation of group. Explain about reducible and irreducible representations.

15. (a) State and prove the additive law of probability.

Or

(b) Define standard deviation. Explain the relation between standard deviation and root mean square deviation.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. If $f(z)$ is analytic function of $z = x + iy$; then we may write $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4\left|f'(z)^2\right|$.

17. Solve the differential equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ by method of separation of variables.

18. Explain in detail about Geodesics.

19. What is special Unitary group? Discuss about irreducible representation of $Su(2)$ and character of $Su(2)$.

20. Derive the normal distribution as the limiting case of binomial distribution.

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D–1590	Sub. Code
	34523

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2021.

Second Semester

ELECTROMAGNETIC THEORY

(CBCS 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are scalar and vector field?

2. How is the unit vector defined in cylindrical coordinate systems?

3. State Stoke's theorem.

4. What is the physical significance of div D?

5. What is displacement current? Write the expression for displacement current.

6. What is the source of electromagnetic wave?

7. Give any two uses of microwaves.

8. What is critical angle and total internal reflection?

9. Define dipole moment.

10. Define surface charge density.

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Distinguish between electric field and electric displacement.

Or

(b) Explain briefly about conservation of energy and momentum.

12. (a) Derive the propagation of plane electromagnetic waves in anisotropic non — conducting media.

Or

(b) Derive Fresnel's equation.

13. (a) Explain total internal reflection on the basis of Maxwell's equation.

Or

(b) Write a short note on coherence of scattering light.

14. (a) Explain Magnetron.

Or

(b) Briefly discuss resonant cavities.

15. (a) Give a brief note on retarded potential.

Or

(b) Explain the conditions for plasma existence.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain :

(a) Transverse nature of electromagnetic waves.

(b) Poynting theorem.

17. Explain in detail about the propagation of plane electromagnetic waves in conducting media and skin depth.

18. Briefly discuss about the normal and anomalous dispersion of electromagnetic waves.

19. Obtain an expression for Clausius – Mossotti relation.

20. What is meant by wave guides? Discuss in detail about the waveguides with reference to the propagation of electromagnetic waves.

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D–1591

Sub. Code
34531

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

Third Semester

Physics

MOLECULAR SPECTROSCOPY

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Give an account of sp^3 hybrids.
2. Define stark effect.
3. State – Mutual Exclusion principle.
4. State the principle of Raman spectrum.
5. How would you account for dissociation in certain molecules?
6. Write a short note on Hyper Raman Effect.
7. Give the principle of multiphoton spectroscopy.
8. Define chemical shift.
9. What is the principle behind NQR?
10. Define Mossbauer spectroscopy.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Discuss the effect of Isotopic substitution on rotational spectrum.

Or

(b) Write a note on hybridization with example.

12. (a) Describe stark effect and its importance in microwave spectroscopy.

Or

(b) Estimate the molecular structure using IR spectroscopy.

13. (a) Give an account of vibrational Raman spectra.

Or

(b) Describe the vibrational spectra of polyatomic molecules.

14. (a) Justify the Raman spectroscopy is a major tool for the study of molecular structure.

Or

(b) Give an account of hyper fine Raman effect.

15. (a) Explain dipole-dipole interaction and spin lattice interactions.

Or

(b) Give the application of Mossbauer spectroscopy for crystal structure and molecular structure.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Discuss rotational spectra of symmetric top molecules.

17. Find the molecular structure using IR and Raman spectroscopy.

18. Explain vibrational spectra of diatomic and polyatomic molecules.

19. What is meant by multiphoton spectroscopy – Explain.

20. Describe the experimental arrangement for studying Mossbauer spectra.

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D–1592	Sub. Code
	34532

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

Third Semester

Physics

QUANTUM MECHANICS – II

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. List some commutation relations for angular momentum operators.

2. Show that $[L_x, L_y] = i\hbar L_z$.

3. Differentiate bosons and fermions.

4. What is the significance of Hartree Fock method than Hartree method?

5. Write down some properties of Dirac's matrices.

6. Why it is necessary to quantize any field?

7. What are partial waves? What do you mean by *s*-wave and *p*-wave?

8. Express Rutherford scattering formula.

9. Give the relativistic equation to be considered for spin zero particle.

10. What is a hole?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Obtain the matrix representation of angular momentum operators, J^2 and J_z.

Or

(b) Write short notes on addition of angular momentum.

12. (a) How do you construct symmetric and antisymmetric wave functions?

Or

(b) Deduce Thomas Fermi model equation.

13. (a) Explain briefly about doublet intensity in alkali atoms.

Or

(b) Explain Hartree's self consistent field theory.

14. (a) Derive the Klein Gordan equation for a free particle.

Or

(b) Discuss the significance of negative energy states.

15. (a) Explain how a non relativistic field represents an assembly of bosons.

Or

(b) Discuss the Born approximation to obtain the scattering amplitude.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Compute the CG coefficients for the system $j_1\ j_2 = 1/2$.

17. Obtain Dirac's relativistic equation for a free particle and solve it.

18. Discuss the construction of periodic table using electronic configuration.

19. Discuss the quantization of Klein Gorden equation and justify how particles accompany its antiparticles.

20. Obtain the classical field equation in Lagrangian form.

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D–1593	Sub. Code
	34533

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

Third Semester

Physics

MICROPROCESSOR AND ELECTRONIC INSTRUMENTATION

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define Opcode and Operand.

2. How many interrupt lines does 8086 have?

3. What is the function performed by SIM instruction in 8085?

4. Draw the flow chart of continuous loop.

5. What are hardware and software interrupts?

6. List some SFRs involved in interrupt programming of 8051.

7. What is DMA data transfer scheme?

8. What are the registers present in 8259?

9. What are sample and hold circuits?

10. Define piezoelectric transducer.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) With suitable example, describe the addressing modes of 8085 microprocessor.

Or

(b) Draw and explain the timing diagram for I/O read operation.

12. (a) What are interrupts? Highlight their advantages.

Or

(b) What is the function of stack pointer? Discuss PUSH and POP operation.

13. (a) Explain the internal RAM organization of 8051 microcontrollers.

Or

(b) Explain what is

(i) memory mapped I/O scheme

(ii) I/O mapped I/O scheme.

14. (a) With neat sketches explain the programmable DMA controller.

Or

(b) Describe how to determine the control word for 8255.

15. (a) Discuss in detail about the thermo resistive transducers.

Or

(b) What are the applications of strain gauges?

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the 8085 architecture with neat pin-out diagram.

17. Elaborate the method of traffic controller interfacing.

18. Mention types of strain gauge. Explain the measurement of resistance using strain gauge.

19. Explain the programmable communication interface 8251.

20. Describe the construction and the use of LUDT for measurement of displacement.

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D–1594

Sub. Code
34541

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

Fourth Semester

Physics

CONDENSED MATTER PHYSICS

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define Miller indices.
2. Classification of crystalline and non-crystalline materials.
3. What do you understand by Fermi energy?
4. Give short notes on pyro electric properties of crystals.
5. State Lorentz field.
6. Explain the classification of magnetic materials.
7. Difference between hard and soft magnetic materials.
8. Write short notes on spin waves.
9. How relate the isotope effect in super conducting?
10. Define super conducting pairs and its important.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Define unit cell. With a neat sketch and explain about Bravais lattice and crystal systems.

Or

(b) Explain and details about Weigner-Seitz cells.

12. (a) Explain the Body-Centered Cubic (BCC) structure.

Or

(b) Derive the expression of Clausius-Mosotti relation.

13. (a) Explain the formation of energy gap on the basis of nearly free electron model.

Or

(b) Derive the expression for Lorentz internal field.

14. (a) Discuss about the quantum theory of paramagnetism.

Or

(b) Explain the working principle of ferromagnetism.

15. (a) Describe Josephson super conducting tunneling.

Or

(b) What is super conductors? Differentiate between Type I and Type II super conductor.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) Discuss and detail about the crystal symmetry operations with neat diagram.

(b) Discuss and detail about the Face-Centered Cubic (FCC) crystal structure.

17. State the Hall effect. Derive the expression for hall voltage and hall co-efficient with neat diagram.

18. Discuss the Kronig-Penny model for the motion of an electron in a periodic potential.

19. Briefly explain Weiss molecular field theory of ferromagnetism.

20. (a) Discuss the formation of cooper pairs and fermi energy gap in super conductor on the basis of BCS theory.

    (b) Compare the properties of Ferromagnetism, Ferrimagnetism and antiferromagnetism.

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D–1595	Sub. Code
	34542

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2021.

Fourth Semester

NUCLEAR AND PARTICLE PHYSICS

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What is α-decay?

2. State Schmidt lines.

3. What are tensor forces?

4. Define scattering cross section.

5. Write Breit–Wigner one level formula.

6. Define nuclear cross section.

7. Define cylindrical nuclear reactor.

8. State–stranseness.

9. Write a note on baryons.

10. What is meant by parity.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) How is internal conversion co-efficient of Sanma rays obtained? Explain.

Or

(b) Explain the measurement of neutrino helicity.

12. (a) Give an account on the single particle model of the nucleus.

Or

(b) Explain how spin–orbit coupling can be accounted on the basis of shell model.

13. (a) Explain how the deuteron wave function is normalized?

Or

(b) What is partial wave analysis? Explain.

14. (a) What are thermal neutrons? Explain.

Or

(b) Explain in detail about the controlled thermo nuclear reactions.

15. (a) What is meant by eight–fold way or octet symmetry? Explain.

Or

(b) State and explain CPT theorem.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Give Fermi's theory of β decay.

17. Give the theory on liquid –drop model of a nucleus (Bohr wheeler theory) and discuss it.

18. Describe yukawa's meson theory of nuclear forces.

19. What is critical size of a reactor? Derive an expression for the critical size of a nuclear reactor.

20. Explain $SU(2)$ and $SU(3)$ symmetry groups.

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D–1596

Sub. Code
34543

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2021.

Fourth Semester

Physics

MATERIALS SCIENCE

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. How does viscoelastic behaviour differ from perfectly elastic behaviour?

2. Which process increases the hardness of material?

3. What are the three types of polymers?

4. Why lattice mismatch is important?

5. Why is diffusion important in materials science?

6. Explain thin film thickness measurement techniques.

7. What does a resonator do on an exhaust?

8. Define pockels effect?

9. What is pseudo elasticity example?

10. Explain the advantages of composite material.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b) in each.

11. (a) Differentiate elastic and inelastic materials.

Or

(b) How to prevent the corrosion of metals?

12. (a) How are thermal evaporation used to prepare thin films?

Or

(b) Define and discuss epitaxy and its types.

13. (a) Give detail explanation on second harmonic generators.

Or

(b) Explain the principle and working of CO_2 laser.

14. (a) Give short notes on polymer matrix composites.

Or

(b) Why does an amorphous solid is called glassy solids?

15. (a) Write down the applications of shape memory alloys.

Or

(b) Briefly explain about MEMS.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the mechanism of corrosion and oxidation of metals.

17. To derive the equation of kinetic theory of gases.

18. Describe in detail the working mechanism of Ruby and Nd-YAG laser.

19. Write down the principle of Kerr effect and explain their types.

20. Describe the fabrication details of piezoelectric and piezo-resistive MEMS materials.

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