D–7595	Sub. Code
	34511

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

First Semester

CLASSICAL MECHANICS

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. State the three Kepler's law of planetary motion.

2. Differentiate conservative and nonconservative forces.

3. State the principle of Least action.

4. Express Hamilton Jacobi equation.

5. Give the condition for canonical transformations.

6. Define moment of inertia and product of inertia.

7. Write down the expression for Euler's equation of motion for a rigid body.

8. List out the postulates of special theory of relativity.

9. Differentiate stable and unstable equilibrium.

10. What are small oscillations?

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain what are holonomic and non-holonomic constraints? Give one example for each.

Or

(b) Explain the principle of virtual work.

12. (a) Derive Hamilton's canonical equations of motion.

Or

(b) Show that transformation defined by $q = \sqrt{2p}\ \sin Q$, $p = \sqrt{2p}\ \cos Q$ is canonical by using poisson bracket.

13. (a) Explain how rotation of coordinate axes enables to determine the moment of interia and product of inertia of any coordinate system.

Or

(b) Show that Poisson bracket is invariant under canonical transformation.

14. (a) Explain the types of special transformations.

Or

(b) Write short notes on momental ellipsoid.

15. (a) Write about equivalence of space and time.

Or

(b) Explain about length contraction and time dilation.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Derive Lagrange's equation from D' Alembert's principle.

17. State and prove Liouville's theorem.

18. Find the transformation matrix for I, II and III rotations.

19. Show that the displacement of a double pendulum is obtained by the superposition of harmonic oscillations of W_1 and W_2.

20. Explain the general theory of small oscillations.

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D–7596	Sub. Code
	34512

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

First Semester

MATHEMATICAL PHYSICS – I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. State Gauss Divergence Theorem.

2. Show that the vectors $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = 3\hat{k}$ and $c = 2\hat{i} + 4\hat{j}$ form a linearly dependent set of vectors.

3. The products of two unitary matrices are also unitary (ie) if A and B are unitary matrices, then AB and BA are also unitary.

4. The eigen values of an orthogonal matrix are unimodular.

5. Write down the beta function and Gamma function.

6. Prove that $P_n(x) = (-1)^n P_n(-x)$.

7. Find the Laplace Transform of the Periodic function $F(t+T) = F(t)$.

8. What are infinite Fourier sine and Cosine transforms?

9. State the orthogonal properties of Legendre Polynomials.

Hence find the values of (i) $\int_{-1}^{+1} [P_4(x)]^2 \, dx$.

10. State orthogonal Properties of Lagurre Polynomials.

PART B — (5 × 5 = 25 marks)

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

11. (a) Find the constants a and b, so that the surface $ax^2 - byz = (a+2)x$ will be orthogonal to the surface $4xy^2 + z^3 = 4$ at the point $(1, -1, 2)$.

Or

(b) Using Gauss divergence theorem evaluate $\iint_S \left(x^3 dy\, dz + y^3 dz\, dx + z^3 dx\, dy\right)$ where S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$.

12. (a) Determine for what value of λ and μ, the equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have (i) no solution, (ii) unique solution and (iii) infinite number of solutions.

Or

(b) Find the characteristic equations of the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ Hence find Eigen values of 'A'

13. (a) Prove that

(i) $\int_0^{\pi/2} \frac{d\theta}{\sqrt{(\sin\theta)}} \cdot \int_0^{\pi/2} \sqrt{(\sin\theta)}\, d\theta = \pi$.

(ii) $\int_0^{\pi/2} \sqrt{(\tan\theta) d\theta} = \frac{\Gamma\frac{1}{4}\Gamma\frac{3}{4}}{2}$

Or

(b) Prove that $\int_{-1}^{+1} \left(1-x^2\right)^n dx = \frac{2^{n+1} n!}{1.3.5.....(2n+1)}$.

14. (a) Show that $\lrcorner 1/2(x) = \sqrt{\left(\frac{2}{\pi x}\right)} \sin x$.

Or

(b) Show that $\int_{-1}^{+1} x P_n(x) P_{n-1}(x) dx = \frac{2n}{4n^2-1}$.

15. (a) Find the finite Cosine transform of $f(x)$ if $f(x) = \sin ax$ and $f(x) = \frac{\pi}{3} - x + \frac{x^2}{2\pi}$.

Or

(b) Find the Laplace transform of

(i) te^{at} (ii) $t^n e^{at}$ (iii) $t^3 e^{-2t}$

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Evaluate $\iint_S (\nabla \times F) \cdot \hat{n} ds$ for the vector $F = \left(x^2 + y - 4\right)\hat{i} + 3xy\,\hat{j} + \left(2xz + z^2\right)\hat{k}$ over the surface of hemisphere $\left(x^2 + y^2 + z^2\right) = 16$ lying above $x - y$ plane.

17. Prove the following

(a) Find the inverse of matrix $\begin{bmatrix} 1 & -1 & 3 \\ -1 & 1 & 2 \\ 3 & 2 & -1 \end{bmatrix}$.

(b) If $A = \frac{1}{9}\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$ show that $A^{-1} = A^T$, A^T being transpose of A.

18. Using Rodrigue's Formula, Prove that

(a) $\int_{-1}^{+1} P_0(x)dx = 2$ (b) $\int_{-1}^{+1} P_n(x)dx = 0 (n \neq 0)$

(c) $\int_{-1}^{+1} x^2 P_5(x)dx = 0$

19. Show that

(a) $H_n(-x) = (-1)^n H_n x$

(b) $H_{2n}(0) = (-1)^n \frac{(2n)!}{n!}$

(c) $H_{2n+1}(0) = 0$

20. Obtain Laplace transform of the function

(a) $f(t) = \sinh at \sin at$ (b) $f(t) = t^2 e^t \sin 4t$

D–7597	Sub. Code
	34513

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

First Semester

LINEAR AND INTEGRATED ELECTRONICS

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define semiconductor.

2. Draw the simple circuit diagram explaining forward bias.

3. Explain CC configuration.

4. What is bias stability?

5. Define MOSFET.

6. What is solar cell? Given two real life example of solar cell.

7. What is operational amplifier?

8. Define slew rate.

9. Define differentiator.

10. Define adder.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain intrinsic semiconductor with necessary diagram.

Or

(b) Briefly explain the characteristics of forward bias of a diode.

12. (a) What is transistor action? Explain.

Or

(b) Draw the circuit diagram of CB configuration of a transistor.

13. (a) State the difference between class A and Class B amplifier.

Or

(b) List out the applications of class C amplifier.

14. (a) Explain voltage divider bias circuit.

Or

(b) Briefly explain RC phase shift.

15. (a) Draw the block diagram of OP-AMP and explain.

Or

(b) State analog computation as application of OP-AMP.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Define forward and reverse bias of a diode and explain.

17. Explain class B push pull amplifier.

18. List out the applications of OP – AMP 741.

19. Explain first order high pass and low pass filters.

20. Explain construction, working and I/O characteristics of JFET.

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D–7598	Sub. Code
	34521

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

Second Semester

QUANTUM MECHANICS - I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Write about wave particle duality.

2. Mention any two properties of Hermitian Operations.

3. What are the allowed energy eigen values of a rigid rotator?

4. Explain quantum mechanical tunneling.

5. How do you represent a state vector and its conjugate in Dirac's notation?

6. Express the matrix form of a, a^+, x and p_x operators.

7. Give the spectrum of three dimensional harmonic oscillator.

8. Write down the connection formula for the barrier to the right of the turning point.

9. Give the expression for Fermi Golden rule.

10. Differentiate spontaneous and stimulated emission.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain some applications of Heisenberg Uncertainty relation.

Or

(b) Derive Schrodinger time dependent wave equation.

12. (a) Find the eigen value and eigen function of a particle in a one dimensional box.

Or

(b) Derive the quantised energy levels of rigid rotator.

13. (a) Derive the equation for Schrodinger picture.

Or

(b) Obtain the ground state of Helium atom using variational principle.

14. (a) Discuss the splitting of energy levels due to Stark effect in Hydrogen atom.

Or

(b) As an application of WKB approximation explain the problem of bound states.

15. (a) Briefly discuss the quantum theory of radiation.

Or

(b) Derive R, θ, and ϕ equation of Hydrogen atom.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Treat the one dimensional harmonic oscillator quantum mechanically.

17. Solve the radial part of Hydrogen atom.

18. Compare and discuss about Heisenberg and Interaction picture.

19. Discuss the principle and phenomenon of Raman scattering.

20. Derive the relation between Einstein's A and B coefficient for transition probability.

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D–7599	Sub. Code
	34522

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION,
DECEMBER 2022.

Second Semester

MATHEMATICAL PHYSICS – II

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is mean by simply connected region?

2. Define singular point of an analytic function.

3. Find the poles of the function $f(z) = \dfrac{1}{(z-2)(z-3)}$.

4. Write the Laplace equation.

5. Define diffusivity of the substance.

6. How many basis vectors for stress tensor?

7. What is called real index?

8. Write the transformation relation for the tensor $A^{\mu\gamma}$.

9. Define abelian group.

10. From a bag containing 4 white and 5 black balls, a man draws 3 at random, what are the odds against these being all black?

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Derive the Cauchy-Riemann conditions.

Or

(b) State and prove Cauchy's fundamental theorem.

12. (a) Find the pole and residue of the function $f(z) = \dfrac{1-2z}{z(z-1)(z-2)}$.

Or

(b) Derive the expression for one dimensional heat flow equation.

13. (a) Using method of separation variables solve $3\dfrac{\partial u}{\partial x} + 2\dfrac{\partial u}{\partial y} = 0$.

Or

(b) Explain the concept summation of coordinates in tensor.

14. (a) Prove that the outer product of tensors $A_{\sigma}^{\mu\gamma}$ and B_{ρ}^{λ} is a tensor of rank 5.

Or

(b) Write a short note on special unitary group $SU(2)$.

15. (a) Discuss about homomorphism.

Or

(b) Describe the Poisson's distribution

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. State and prove Laurent expansion theorem.

17. Evaluate the following integral using residue theorem $\int_c \frac{4-3z}{z(z-1)(z-2)}\,dz$, where 'C' is the circle $|z| = \frac{3}{2}$.

18. Obtain the one dimensional wave equation of vibrating string.

19. State and prove Quotient law.

20. Elaborately explain the reducible and irreducible representations.

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D–7600

Sub. Code
34523

DISTANCE EDUCATION

M.Sc.(Physics) DEGREE EXAMINATION, DECEMBER 2022.

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. Define scalar and vector and give examples.

2. What is the physical significance of curl of a vector field?

3. Define divergence.

4. Write the point of continuity equation and explain its significance.

5. Write any four properties of electromagnetic waves.

6. Give the mathematical form of Ampere – Maxwell law.

7. What are the two conditions for total internal reflection?

8. State Snell's law.

9. What is scattering of electromagnetic waves?

10. Define linear charge density.

PART B — (5 × 5 = 25 marks)

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

11. (a) Explain the transverse nature of electromagnetic waves.

Or

(b) Explain Poynting theorem.

12. (a) Describe the wave equation propagating through a free space for electromagnetic wave.

Or

(b) Explain the boundary conditions at the surface of discontinuity.

13. (a) State and explain Brewster's law and degree of polarization.

Or

(b) Explain total internal reflection.

14. (a) Discuss about the generation of microwaves.

Or

(b) Explain Gunn diodes.

15. (a) Derive Lienard – Wiechert potential.

Or

(b) Write a short note on pinch effect.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain in detail about the reflection and refraction of electromagnetic waves at the interface of non – conducting media.

17. Explain the depression on electromagnetic waves in gases and the experimental demonstration of anomalous dispersion in gases.

18. Derive an expression for Clasusius – Mossotti relation.

19. Write a note on the theory of scattering of electromagnetic waves.

20. Explain

    (a) the conditions for plasma existence.

    (b) Propagation of high frequency electromagnetic waves in plasma.

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D–7601

Sub. Code
34531

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

Third Semester

MOLECULAR SPECTROSCOPY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is meant by Sp^2 hybridization?

2. Write a note on molecular orbital theory.

3. Explain Franck – Condon Prinicple.

4. Define Predisassociation energy.

5. Distinguish between rotational and vibrational spectra of diatomic molecules.

6. Write a note on Anti-Stoke's Raman Scattering.

7. What do you understand about Photo acoustic Raman Scattering.

8. Explain Chemical Shift.

9. What is meant by nuclear resource.

10. What is the principle behind ESR.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the valence bond theory of hydrogen molecule.

Or

(b) What is the need for hybridization.

12. (a) How the Stark effect is used to find electric dipole moment.

Or

(b) Discuss rotational energy of a diatomic molecule.

13. (a) How is dissociation energy of a molecule determined.

Or

(b) Give an account of Vibrational Raman Spectra.

14. (a) Discuss stimulated Raman Scattering.

Or

(b) Give an account of hyperfine Raman effect.

15. (a) Derive Bloch equations for nuclear resonance.

Or

(b) How is Mossbauer Spectroscopy used for molecular structure determination?

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Give the Heitler London theory for hydrogen molecule.

17. Explain the theory on diatomic linear molecule using Raman Spectroscopy.

18. How does Franck – Condon Principle. Explain the intensity distributions of electronic bond.

19. Explain the Photo acoustic Raman Scattering.

20. Explain the detail about the Mossbauer Spectroscopy and its applications.

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D–7602

Sub. Code
34532

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

Third Semester

QUANTUM MECHANICS – II

(CBCS 2018-2019 Academic Year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write the matrix form of angular momentum operator.

2. What are Spinors?

3. What are identical particles?

4. When a field is said to be self-consistent?

5. Differentiate bosons and fermions.

6. Express de Alembertian operator.

7. What are holes?

8. Write down the properties of Dirac matrices.

9. Write down Lorentz gauge condition.

10. What are partial waves?

PART B — (5 × 5 = 25 marks)

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

11. (a) Write short notes on addition of angular momentum.

Or

(b) Show that $[L^2, L_{\pm}]=0$ where L is the angular momentum operator.

12. (a) Prove that $[L_x, xP_x]=0$ and find $L_+ L_-$ and $L_- L_+$.

Or

(b) Deduce Thomas Fermi model equation.

13. (a) Write short notes on symmetric and antisymmetric wavefunctions.

Or

(b) Explain why the dimension of Dirac's matrices has to be even and obtain the Dirac's matrics.

14. (a) Explain Hartree's method of self consistent field theory.

Or

(b) Explain how to quantize a Dirac field.

15. (a) What is the physical meaning of scattering cross section? Define scattering amplitude and relate it with scattering cross section.

Or

(b) Discuss the validity of Born approximation.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Solve the Dirac equation for free particles and explain the salient features of the energy spectrum.

17. Describe how the concept of spin has evolved automatically from Dirac's Hamiltonian.

18. Describe the quantization of non relativistic Schrodinger equation.

19. Show that σ does not commutes with the Dirac Hamiltonian, but $\sigma . p$ commutes with Dirac Hamiltonian.

20. Describe the general theory of partial wave analysis in scattering.

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D–7603

Sub. Code
34533

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

Third Semester

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. What is implicit addressing?

2. Under what situation. Intel 8086 is used in minimum and maximum mode of operation.

3. Define fetch cycle and execute cycle.

4. What are microcontrollers?

5. Define direct byte addressing of 8051.

6. How many I/O parts are placed in microcontroller 8051?

7. Name the modes of operation of DMA controller.

8. Define successive approximation.

9. What is the need for programmable interrupt controller?

10. What are transducers?

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the various arithmetic Instructions available in 8085 microprocessor.

Or

(b) Draw a schematic diagram of register organization of Intel 8086 and write notes on general purpose register.

12. (a) Narrate the logic operation of 8085.

Or

(b) Discuss about the software development tools?

13. (a) List the features of 8051 microcontrollers.

Or

(b) Write a program to find the smallest number in an array using 8051 microcontroller.

14. (a) Briefly explain the data transfer scheme.

Or

(b) Describe the various priority modes of 8259 programmable interrupt controller.

15. (a) Explain the resistor ladder circuit network method with neat diagram.

Or

(b) Write short notes on capacitive transducers.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Write down the pin description of 8086.

17. Write an assembly language program to multiply two 8 bit numbers.

18. With a schematic diagram explain the architecture of Intel 8255A and its operating modes.

19. Show general interface connections to measure and control temperature employing a microprocessor based scheme for controlling a stepper motor.

20. Explain the following

    (a) photovoltaic cell

    (b) photoconductive cell

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D–7604

Sub. Code
34541

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

Fourth Semester

CONDENSED MATTER PHYSICS

(CBCS 2018-2019 Academic Year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define unit cell.

2. Define primitive cell.

3. What is space lattice?

4. List type of lattices.

5. Define dielectric constant.

6. Define Meissner effect.

7. What is type I semiconductor?

8. Define ferrites.

9. List piezoelectric properties of a crystal.

10. What are spin waves?

PART B — (5 × 5 = 25 marks)

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

11. (a) Define local electric field.

Or

(b) Define types of lattices.

12. (a) Explain Wigner-Seitz cell with example.

Or

(b) Briefly explain lattice vibrations.

13. (a) Describe electrical properties of metal.

Or

(b) Explain the ordered phase of matters.

14. (a) What is Bravais lattice? Explain.

Or

(b) Briefly explain Fermi energy.

15. (a) Briefly explain anti-ferromagnetic theory.

Or

(b) List out electronic properties of a crystal.

PART C — (3 × 10 = 30 marks)

Answer any THREE the following.

16. Explain translation and orientation order of a crystal.

17. Explain about HCP structure with an example.

18. Draw the Bravais lattices.

19. Derive the equation for free electron gas in three dimensions.

20. State the differences between soft and hard magnetic materials.

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D–7605	Sub. Code
	34542

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION, DECEMBER 2022.

Fourth Semester

NUCLEAR AND PARTICLE PHYSICS

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Explain the selection rules of β – *decay* .

2. Define electric quadrupole moment.

3. What are Schmidt lines.

4. What is partial wave analysis?

5. What is scattering lens?

6. Write a short note on thermal neutrons.

7. State – Nuclear Cross Section.

8. What is meant by resonance scattering?

9. Write a note on stransness of a particle.

10. Explain – Baryons.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) What do you mean by internal conversion of Gamma rays? Explain.

Or

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

12. (a) What are Kurie Plots? Explain.

Or

(b) Define helicity? How is the helicity of neutrino measured.

13. (a) Discuss the effective range theory in detail.

Or

(b) What is nucleon – nucleon potential? Explain.

14. (a) Derive an expression for the critical size of a nuclear reactor.

Or

(b) Write a detail note on Sources of Stellar energy.

15. (a) Give a detailed account on

(i) Leptons (ii) quarks

Or

(b) Discuss about the Charse Conjugation.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Describe the Fermi's theory ob Beta decay.

17. Discuss the collective model of nuclei in detail.

18. Explain n-p scattering at low energies.

19. Obtain Breit – Wigner one level formula for resonance scattering. Deduce the level width.

20. What are fundamental interaction? Explain in detail.

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D–7606

Sub. Code
34543

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION,
DECEMBER 2022.

Fourth Semester

MATERIALS SCIENCE

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. List out the properties of polymers.

2. Why do we need diffusion pumps?

3. What are epitaxy?

4. Why CO_2 laser is multilevel laser?

5. Define population and population inversion.

6. Distinguish light and laser.

7. Define polymer – matrix composites.

8. List out the use of composite materials in biomedical field.

9. Enumerate the preparation methods for smart materials.

10. Define MEMS.

PART B — (5 × 5 = 25 marks)

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

11. (a) Describe in detail visco-elastic behavior of materials.

Or

(b) Write a short note additional condensation polymerization.

12. (a) Briefly explain the prevention of corrosion and oxidation of metals.

Or

(b) Describe the function of TURBO molecular pumps.

13. (a) Describe in short liquid phase epitaxy.

Or

(b) How will you measure the thickness of the thin films?

14. (a) Write a short note on Q – switching.

Or

(b) Write a short note on Gas laser.

15. (a) What are shape memory alloys? Give it's any five applications.

Or

(b) Write a short note on Pseudo elasticity.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Discuss in detail mechanical behavior of Visco-elastic materials.

17. Discuss in detail principle and working of thermal evaporation technique to prepare thin film.

18. Calculate the DOF for CO_2. Explain detail the principle and working of CO_2 laser.

19. Describe in detail photorefractive materials and its applications.

20. Discuss in detail any one technique to prepare SMA with neat mechanism.

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