D-6923

Sub. Code
34511

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

First Semester

CLASSICAL MECHANICS

(CBCS 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are generalised coordinates?

2. Write down the Hamilton's canonical equations.

3. State D Alembert's principle.

4. Define Hamilton's characteristic function.

5. What do you mean by virtual displacement and virtual work?

6. Define Poisson bracket of two dynamical variables.

7. What are Eulerian angles?

8. What is inertia ellipsoid?

9. Differentiate special theory and general theory of relativity.

10. Explain what do you mean by equilibrium classify its types.

PART B — (5 × 5 = 25 marks)

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

11. (a) State Newton's laws of motion. Give a critical review of the laws.

Or

(b) Discuss the principle of least action.

12. (a) Explain Hamilton's principle for conservative system.

Or

(b) Give an account of Hamilton-Jacobi theory.

13. (a) Derive the equation of motion of compound pendulum.

Or

(b) Derive an expression for the kinetic theory in terms of moment of inertia and angular velocity.

14. (a) Define Lagrange's bracket and Poisson bracket and establish their relation.

Or

(b) What are principal axes and principal moment of inertia at a point? What are their principal properties?

15. (a) Calculate the angular momentum of a rigid body rotating about a fixed axis with angular velocity ω.

Or

(b) Obtain the relativistic formula for the addition of velocities.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. What are ignorable coordinates? Explain how Routhian procedure eliminates these coordinates from equations of motion.

17. Deduce mass-energy equivalance relation of Einstein.

18. Derive the equations of Lorentz transformation.

19. What are normal vibrations and normal coordinates? Discuss the small oscillation of the CO_2 molecule and obtain their frequencies of their modes.

20. Derive an expression for moment of inertia of a body about any line through the origin of a coordinate frame.

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D-6924

Sub. Code
34512

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

First Semester

MATHEMATICAL PHYSICS – I

(CBCS 2018 – 19 Academic year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. If A and B irrotational, prove that $A \times B$ is solenoidal.
2. State Stoke's theorem.
3. If a matrix A satisfies d relation $A^2 + A - I = 0$. Prove that A^{-1} exists and $A^{-1} = I + A$, where I is identify matrix.
4. What do you mean by eigen values of matrix?
5. Show that $\sqrt{\frac{1}{2}} = \sqrt{\pi}$.
6. Show that the Legende's equation is self adjoint.
7. Show that $P_n(1) = 1$ and $P_n(-1) = (-1)^n$.
8. Give the orthonormality relation correcting the Hermite Polynomials.
9. Find the Laplace transform of e^{at}.
10. State and prove linearity theorem of Fourier's transform.

PART B — (5 × 5 = 25 marks)

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

11. (a) Verify Stoke's theorem for the vector field

$$A = (3x - 2y)\hat{i} + x^2 z\hat{j} + y^2(z+1)\hat{k}$$

For a plane rectangular area with vertices at (0, 0), (1, 0) (1, 2), (0, 2) in the $x - y$ plane.

Or

(b) (i) $div(A \times B) = B$ Curl $A - A$. Curl B.

(ii) Curl $(A \times B) = (B \cdot \nabla)A - (A \cdot \nabla)B +$
$A\, div\, B - B\, div\, A$

Prove that following vector identifies.

12. (a) Diagonalise the following matrices

(i) $\begin{bmatrix} \frac{4}{3} & \frac{\sqrt{2}}{3} \\ \frac{\sqrt{2}}{3} & \frac{5}{3} \end{bmatrix}$

(ii) $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

Or

(b) Find the inverse of matrix $\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -3 & 2 \end{bmatrix}$.

13. (a) Show that $\int_{-1}^{+} P_n(x) P_m(x) dx = \frac{2}{2n+1} \delta_{mn}$.

Or

(b) Solve completely Bessel's equation $\frac{x^2 d^2y}{dx^2} + \frac{x dy}{dx} + \left(x^2 - \frac{1}{x}\right) y = 0$ prove two solutions can be written in the form $\frac{\sin x}{\sqrt{x}}$ and $\frac{\cos x}{\sqrt{x}}$.

14. (a) Define hermite polynomial and derive recurrence formula

$$2x\, H_n(x) = 2nH_{n-1}(x) + H_{n+1}(x)$$

Or

(b) Prove the following :

(i) $xL_n'(x) = nL_n'(x) - nL_{n-1}(x)$

(ii) $L_n(x) = L_{n-1}'(x) - L_{n-1}(x)$.

15. (a) Evaluate the following by use of convolution theorem $L^{-1}\left\{\frac{s}{(s^2 + a^2)^2}\right\}$.

Or

(b) Find the Finite Fourier sine transforms

(i) $\sin Kt$

(ii) $\cos Kt$

(iii) $e\frac{-K\pi}{t}$.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Verify Stoke's theorem for the vector $A = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ over the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$.

17. Find the matrix B such that $A = BC$ where $A = \begin{bmatrix} 2 & 3 & -2 \\ 4 & -1 & -2 \\ 0 & 1 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 2 & -1 \\ 2 & -1 & -1 \\ -1 & 2 & 0 \end{bmatrix}$.

18. Prove that if m is an integer less that n, then $\int_{-1}^{+1} x^m P_n(x)dx = 0$ and $\int_{-1}^{+1} x^n P_n(x)dx = \frac{2^{n+1}(n!)^2}{(2n+1)!}$.

19. Prove that $J_n(x)J'_{-n}(x) - J'_n(x)J_{-n}(x) = \frac{-2\sin n\pi}{\pi x}$.

20. Find the inverse Lapalce transform of $F(s) = \frac{1}{s(s+2)^3}$ and $\frac{1}{(s+1)(s^2+1)}$.

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D–6925

Sub. Code
34513

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

First Semester

LINEAR AND INTEGRATED ELECTRONICS

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Which are the most commonly used semiconductors and why?

2. What is a tunnel diode?

3. Draw the symbol 07 NPN and PNP transistor and specify the leads.

4. Define “Transistor action”.

5. What are the difference between FET and BJT?

6. Give the two Barkhausen conditions required for sinusoidal oscillations to be sustained.

7. Elaborate the difference between SCR and TRIAC.

8. What is slew rate?

9. Define the term of "CMRR".

10. What is a comparator?

PART B — (5 × 5 = 25 marks)

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

11. (a) What are the difference between intrinsic and extrinsic semiconductors?

Or

(b) Explain the working of Schottky diode. Sketch and discuss the VI characteristics of Schottky diode.

12. (a) Sketch neatly the circuit diagram of a class B push-pull amplifier.

Or

(b) What is meant by dc load line? How will you draw dc load line on the output characteristic of a transistor?

13. (a) Explain the working of a JFET.

Or

(b) Explain the operation of a wien-bridge oscillator with the help of neat circuit diagram.

14. (a) Explain the construction and working of a DIAC.

Or

(b) Briefly explain how the oscillations are maintained in Hartley oscillator.

15. (a) Describe some of the characteristics of a practical and ideal OP-AMP.

Or

(b) Derive an expression for the voltage gain of an inverting amplifier.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Draw characteristics of a zener diode. Explain with the help of a circuit diagram its use as voltage regulator.

17. Describe an experiment to draw the characteristic curves for a transistor in C-E mode.

18. Discuss briefly the construction, working and characteristics of an SCR.

19. Sketch and explain the construction of an N-channel enhancement and depletion MOSFET.

20. What are the different types of active filters? Explain briefly.

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D–6926

Sub. Code
34521

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Second Semester

QUANTUM MECHANICS–I

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define the expectation value of any dynamical variable.
2. Explain quantum mechanical tunneling.
3. Write down the Schrodinger wave equation for a particle in a box.
4. What do you mean by a rigid rotator?
5. How do you represent a state vector and its conjugate in Dirac's notation?
6. Find the spacing between successive energy levels of hydrogen atom.
7. What do you understand by classical turning point?
8. Define transition probability.
9. Write down the selection rules for 'm' and 'l'.
10. What is the first order correction to the n^{th} energy eigen value?

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Obtain the solution of time dependent Schrodinger equation.

Or

(b) What are the physical significance of wave function? Write down its limitations.

12. (a) Discuss about bound states and parity operator.

Or

(b) Derive 'r', 'θ' and 'ϕ' equations of Hydrogen atom.

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

Or

(b) Using variation method, discuss about the ground state of Helium atom.

14. (a) Write about first order time dependent perturbation theory.

Or

(b) State and explain variational principle.

15. (a) Explain the quantum theory of radiation.

Or

(b) Explain Rayleigh's scattering using perturbation theory.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. State and explain uncertainty principle. Show that an electron cannot be inside a nucleus using this principle.

17. Solve the harmonic oscillator problem using operator method.

18. Using time independent non degenerate perturbation theory, Obtain expressions for the first order correction to the energy eigen value and eigen functions.

19. Describe WKB method and obtain the connection formula. What is the drawback of this method?

20. Solve the radial part of Hydrogen atom.

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D–6927	Sub. Code
	34522

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Second Semester

MATHEMATICAL PHYSICS -II

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is mapping?

2. Define contour integrals.

3. Write the heat conduction equation.

4. What do you mean by Green's function?

5. Define Hermitian operators.

6. Show that the algebra of tensors.

7. Write a note on irreducible tensor.

8. Prove that the group of the order two is always cyclic.

9. What do you mean by Random variables?

10. Find the probability that almost 5 defective fuses will be found in a box of 200 fuses if experience show that 2 percent of such fuses are defective.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) State and prove cauchy integral theorem.

Or

(b) Write down the procedure of method of steepest descents.

12. (a) Obtain one-dimensional heat flow equation along a bar in the form $\frac{\partial u}{\partial t} = h^2 \frac{\partial^2 u}{\partial x^2}$.

Or

(b) Explain about Sturm- Liouville theory.

13. (a) State and explain about Quotient law.

Or

(b) What is Reimann? chrnstoffel's tensor? Give its cyclic properties.

14. (a) Explain about isomorphism and homomorphism.

Or

(b) What is SU (2) group? Give its irreducible representation.

15. (a) State and explain central limit theorem.

Or

(b) Find mode and median for the frequency curve $y = \frac{1}{2}\sin x, 0 \le x \le \pi$.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Find the solution $u(x,t)$ for the partial differential equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ has the boundary condition are $u(0,t) = 0,\ u(2,t)$

17. Explain about four vectors in special relativity.

18. What is group? Explain about construction of character tables.

19. Explain the symmetry group of Schrodinger equation.

20. Describe the gauss normal distribution with its properties.

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D–6928

Sub. Code
34523

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Second Semester

Physics

ELECTROMAGNETIC THEORY

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. State magnetostatics

2. Define Maxwell's equation.

3. Write Fresnel's equation for non-conducting media.

4. State Brewster's Law.

5. How do normal and anomalous dispersion differ?

6. What are the types of wave guides?

7. What is scattering?

8. What are the applications of klystron?

9. State lie card -Wiechert potential.

10. Define pinch effect.

PART B — (5 × 5 = 25 marks)

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

11. (a) Derive wave equation interms of scalar and vector potential.

Or

(b) Explain the propagation of plan electromagnetic waves in conducting medium.

12. (a) Describe the boundary conditions at the surface of discontinuity.

Or

(b) Discuss the experimental demonstration of anomalous dispersion in gases.

13. (a) Discuss the theory of polarization of scattering light.

Or

(b) Briefly explain the gunn diodes in microwaves.

14. (a) Derive Liecard-Wiechert potentials for a moving point charge.

Or

(b) Describe the conditions for plasma existence.

15. (a) Discuss the motion of charged particles in homogeneous magnetic fields.

Or

(b) Briefly discuss the magnetic confinement devices.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the propagation of electromagnetic waves in free space.

17. Describe the reflection and refraction of electromagnetic waves at interface of non-conducting media.

18. What is dispersion? Discuss it in the case of gaseous medium having both real and complex refractive index.

19. What are the modes in wave-guide? Discuss TE wave propagation in a rectangular wave-guide.

20. Derive magneto hydrodynamics equations.

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D–6929

Sub. Code
34531

DISTANCE EDUCATION

M.Sc. (PHYSICS) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Third Semester

MOLECULAR SPECTROSCOPY

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are lone pair electrons? Give examples.

2. Outline the effect of isotopic substitution on the rotational spectra of molecules.

3. State the conditions for a vibration to be Raman active.

4. Explain mutual exclusion principle with example.

5. How does the nuclear quadrupole moment differ from nuclear quadrupole coupling constant?

6. State Frank-Condon principle.

7. Give the basic principle of stimulated Raman scattering.

8. What is Doppler free two – photon absorption?

9. Explain the principle of ESR.

10. Write a brief note on Mossbauer sources.

PART B — (5 × 5 = 25 marks)

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

11. (a) Give an account of the rotational spectra and energies of rigid linear diatomic molecules.

Or

(b) What is LCAO approximation? List the conditions to be satisfied by contributing atomic orbitals to generate an effective MO.

12. (a) Taking a specific example, explain the procedure for determining the molecular structure from Raman and infrared spectra.

Or

(b) Explain a diatomic vibrating rotator and obtain its energy levels.

13. (a) Explain dissociation, predissociation and their role in electronic spectra of molecules.

Or

(b) What is hyper Raman effect? Give the classical treatment of hyper Raman effect.

14. (a) Explain (i) Two photon absorption and (ii) Multiphoton absorption.

Or

(b) Discuss the theory of NMR and obtain the condition for resonance.

15. (a) Outline some of the differences between NMR and NQR. Explain how NQR spectroscopy helps in studying hydrogen bonding in crystals.

Or

(b) Explain any two applications of Mossbauer spectroscopy.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. What is called hybridization? Explain in detail SP, SP^2, SP^3 and other hybridization giving rise to different spatial arrangements of orbitals.

17. Describe the formation of spectral lines due to vibrational Raman spectra. Also discuss the rotational fine structure in the spectrum.

18. Explain Born-Oppenheimer approximation. Discuss the intensity distribution in the absorption spectra of diatomic molecules.

19. Obtain on expression for the interaction between the spin of the nucleus and an applied magnetic field. Define relaxation time. Discuss spin-spin relaxation and spin-lattice relaxation.

20. Explain in detail the inverse Raman effect. Describe the experimental arrangement for studying the inverse Raman effect.

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D–6930

Sub. Code
34532

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

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. Show that $\sigma_x^2 = \sigma_y^2 = \sigma_z^2 = 1$.

2. Evaluate $\left[J_+, J_-\right]$

3. What are the drawbacks of Klein Gordon equation?

4. Show that the trace of the Dirac Matrix is zero.

5. Define (a) differential scattering cross-section and (b) Total Scattering cross-section.

6. What are the limitations of Born approximation?

7. Interpret the concept of identical particles.

8. What are Clebsch Gordon coefficients?

9. What is meant by second quantisation?

10. Write an example for

(a) Non relativistic field and

(b) Relativistic field.

PART B — (5 × 5 = 25 marks)

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

11. (a) Write down the Paulis spin matrices. Show that $\sigma_x\sigma_y + \sigma_y\sigma_x = 0$.

Or

(b) Establish the commutation relation relating the angular momentum operators.

$[J_Z, J_\pm] = \pm\hbar J_\pm$ where $J_+ = J_x + iJ_y$ and $J_- = J_x - iJ_y$

12. (a) Prove that the symmetry of the wave function is invariant with respect to time for a system of identical particles.

Or

(b) How did Hartee obtain the central field in his theory of many electron atom.

13. (a) Derive Klein Gordon for a free particle and find its solution.

Or

(b) Write down the significance of negative energy states.

14. (a) Explain in detail about Schrodinger field.

Or

(b) Show that $\frac{d\sigma}{d\Omega} = |f(\theta, \phi)|^2$.

15. (a) Derive an expression for scattering amplitude using born approximation.

Or

(b) Discuss the quantization of electromagnetic field.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Calculate the Clebsch Gordon coefficient for $j_1 = \frac{1}{2}$ and $j_2 = \frac{1}{2}$.

17. Explain Thomas Fermi model of the atom. Derive Thomas Fermi equation.

18. Calculate the differential scattering cross-section for screened coloumb potential $V(r) = \frac{-Ze^2}{r} e^{-r/a}$

19. (a) Show that for a system of identical particles the symmetry of the wavefunction does not change in time.

(b) Describe the procedure for constructing a symmetrized wavefunction from unsymmetrized functions.

20. Derive the Dirac's relativistic wave equation for a free particle. Obtain the Dirac matrices. Also write the properties of Dirac matrices.

D–6931	Sub. Code
	34533

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Third Semester

MICROPROCESSOR AND ELECTRONIC INSTRUMENTATION

(CBCS 2018 – 2019 Academic Year Onwards)

Time : 3 hours Maximum : 75 marks

PART A — 10 × 2 =20 marks)

Answer ALL questions.

1. List the four operations performed by MPU.

2. What is a bus? Specify the direction of the information flow on the address bus.

3. Explain ' LOCK ' in 8086 microprocessor.

4. What are the extra flags available in 8086 microprocessor comparing to 8085 microprocessor?

5. What are the RISC and CISC processors?

6. What are the types of interrupts in 8051?

7. Define accuracy and resolution of a D/A converter.

8. What is equivalent binary weight?

9. What is the difference between active and passive transducers?

10. What is and LVDT? Where it is used?

PART B — (5 × 5 = 25 marks)

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

11. (a) Describe instruction cycle, machine cycle and state.

Or

(b) Write a simple ALP using a Register pair as a Loop counter.

12. (a) Explain the operation of the programming interrupt controller 8259, with the aid of a schematic diagram.

Or

(b) Draw the schematic diagram of the programmable peripheral interface 8255 and explain the BSR mode of the operation.

13. (a) Explain the working principle of a 4-bit binary weighted resistor D/A converter with a circuit diagram

Or

(b) Explain the working principle of a continuous A/D converter with a circuit diagram

14. (a) What is the need for different addressing modes in a microcontroller instruction set? Explain with suitable examples the four addressing techniques employed in the instruction set of 8051 microcontroller

Or

(b) Write an assembly language to subtract two 8-bit numbers using 8051 microcontroller.

15. (a) Describe the principle and operation of the thermoelectric transducer.

Or

(b) Write a note on photovoltaic cell and photoconductive cell.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the data transfer, branch and arithmetic instruction set and its functions.

17. Discuss the maximum mode configurations 8086 microprocessor with suitable diagrams.

18. Draw the block diagram of 8051 microcontroller and explain the function of each block

19. What do you mean by baud rate? What is the necessity of serial data transfer? Draw the schematic diagram of 8251 programmable communication interface and explain its operation.

20. Explain how A/D converter is interfaced with a microprocessor to control stepper motor with necessary diagrams and explain its function.

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D–7344

Sub. Code
34541

DISTANCE EDUCATION

M.Sc. (Physics) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Fourth Semester

CONDENSED MATTER PHYSICS

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. Define Lattice, basis and crystal structure.

2. What do you understand by miller indices of lattice plane?

3. How does Madelung constant vary with the number of nearest neighbours?

4. State Bragg's law.

5. What is meissner effect?

6. What is the depolarization field?

7. Give the expression of dielectric constant.

8. Define magnetization and magnetic susceptibility.

9. What is Fermi surface?

10. State Bloch theorem.

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Describe crystal structure of (i) Nacl and (ii) Diamond.

Or

(b) Describe reciprocal lattice of C and BCC.

12. (a) Describe the Kronig-Penny model for the origin of energy gap.

Or

(b) Describe the expression for intrinsic carrier concentration of a semi conductor.

13. (a) Discuss on the quantization of orbits in magnetic field.

Or

(b) Describe the Weiss theory of Ferro magnetism and arrive curie-Weiss law.

14. (a) Describe the Langevin theory of diamagnetism.

Or

(b) Explain quantum theory of paramagnetism and derive an expression for the paramagnetic susceptibility.

15. (a) Derive the London equations. Explain about the DC Josephson effect with diagrams.

Or

(b) Explain the phenomenon of vibrations of one dimensional mono atomic linear lattice and hence derive dispersion relation.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. When X-ray beam is incident on NaCl crystal with lattice spacing 2.82×10^{-10} m, the first order Bragg reflection is observed at a glancing angle of 8°35'. What is the wavelength of X-rays?

17. Calculate London penetration depth at 2K in Pb. Its value at 0K is 390 Å. How does it vary with temperature? What happened when T=Tc.

18. Give the characteristic temperature θ_w^c = 65° and θ_m^c = 59° for solid Krypton, estimate the vibrational zero point energy.

19. Estimate the numerical value for the Lorenz number using Wieldmann-Franz ratio.

20. The radius of the helium atom is about 0.55 Å. Calculate the polarizability of helium atom and its relative permittivity. The number of helium atoms in a volume of one meter cube is 2.7×10^{25} atoms.

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D–7345

Sub. Code
34542

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Fourth Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Explain electric quadrupole moment.

2. Write short note on collective model of the nucleus.

3. Explain the basic principle of a nuclear reactor.

4. How do you distinguish various nuclear reaction mechanisms?

5. Explain briefly nuclear isomerism.

6. What do you mean the electron capture?

7. What are the limitations of single particle nuclear model?

8. Mention different types of nuclear reactors.

9. What are Quarts?

10. Explain CPT invariance.

PART B — (5 × 5 = 25 marks)

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

11. (a) Describe briefly the single particle model of the nucleus. What nuclear properties can be accounted for by this method?

Or

(b) Explain Bohr Wheeler theory. Write note on Schmidt lines.

12. (a) Explain the requirements (necessary conditions) for a reaction.

Or

(b) Explain stripping reactions.

13. (a) Write notes on conservation laws.

Or

(b) Describe the properties of elementary particles.

14. (a) What are thermal neutrons? Explain the neutron cycle in a thermo nuclear reactor.

Or

(b) Write short note on :

(i) Source of stellar energy.

(ii) Controlled thermo nuclear reactions.

15. (a) Explain neutron-proton scattering at low energies.

Or

(b) Outline briefly the classification of fundamental forces.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss in detail, the Fermi theory of Beta decay.

17. Explain the following reactions mechanisms :

(a) Compound Nucleus Mechanism

(b) Direct Reaction Mechanism

(c) Pre-equilibrium Reaction Mechanism.

18. Write a detailed note on the classification of elementary particles.

19. Explain in detail the nuclear shell model. List out some of the shortcomings of shell model.

20. Explain charge conjugation and parity. Obtain the Gell-Mann-Nishijima relation.

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D–7346

Sub. Code
34543

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Fourth Semester

Physics

MATERIALS SCIENCE

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. Define Fatigue.
2. Explain the properties of polymers.
3. What is meant by oxidation of metals?
4. State the kinetic theory of gases.
5. Explain how to measure the thickness of the thin films.
6. Define Epitaxy.
7. Explain the condition to achieve population inversion.
8. Define Kerr effect.

9. Difference between the carton matrix and metal matrix composites.

10. Define MEMS.

PART B — (5 × 5 = 25 marks)

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

11. (a) Define polymers? Explain the structure and properties of polymers.

Or

(b) Write a short note on corrosion and oxidation of metals.

12. (a) Explain the instrumentation and working principle of Turbo molecular pumps.

Or

(b) Define the vapour phase Epitaxy and give a short note on it.

13. (a) Write a short note on Q-switching and mode locking.

Or

(b) Explain the working principle of Nd-YAG laser with its energy level diagram.

14. (a) Write a short note on second Harmonic Generators.

Or

(b) Explain the concept of polymer matrix composites.

15. (a) Describe the working mechanism of shape memory alloys.

Or

(b) Give the applications of micro actuators and micro accelerometers.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Describe in detail about the elastic, in elastic and viscoelastic behaviour of materials.

17. Explain the mechanism behind the pirani and penning Gauges with a suitable diagrams.

18. Describe briefly about the Epitaxy of the compound semiconductors with its applications.

19. State the principle of laser and the population inversion in three level and four level systems.

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

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