MANAV RACHNA UNIVERSITY

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**DEPARTMENT OF PHYSICS**

*"T3 Examination, December-2021"*

| | | | |
|---|---|---|---|
| SEMESTER | III | DATE OF EXAM | 2-12-2021 |
| SUBJECT NAME | Quantum Mechanics | SUBJECT CODE | PHH 201B-T |
| BRANCH | PHYSICS | SESSION | Morning |
| TIME | 3Hrs | MAX. MARKS | 100 |
| PROGRAM | B.Sc. | CREDITS | 4 |
| NAME OF FACULTY | Dr. JAIPARKASH | NAME OF COURSE COORDINATOR | Dr. JAIPARKASH |

*Note: All questions are compulsory.*

*Set-A*

| | Q.NO. | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A | Q1(a) | What are de-Broglie Waves? Show that the de-Broglie wavelength of a particle of momentum p is h/p. | 7 | CO1 | BT2 | 1.3.1, 2.1.2, 2.2.4 |
| | Q1(b) | Calculate the value of the retarding potential needed to stop the photoelectrons ejected from a metal surface of work function 1.2 eV with light of frequency $5.5\times10^{14}$ Hz. | 3 | CO1 | BT3 | 1.3.1, 2.1.2, 2.2.4 |
| PART-B | Q2(a) | Calculate the expectation value of p and $p^2$ for the wave function, $\Psi = \sqrt{\left(\frac{2}{L}\right)}\, Sin\frac{\pi x}{L}$ in the region $0 < x < L$ and zero elsewhere. | 5 | CO2 | BT3, BT6 | 1.3.1, 2.1.2, 2.2.4 |
| | Q2(b) | Find the value of A in such a way that the wave function $\Psi = A\, e^{-\alpha x}$ for $x > 0$ & $\Psi = A\, e^{\alpha x}$ for $x < 0$ is normalized, where $\alpha$ is a positive constant. | 5 | CO2 | BT3 | 1.3.1, 2.1.2, 2.2.4 |
| PART-C | Q3(A) | Solve the Schrodinger equation for a rigid rotator and obtain the eigen values of energy & eigen functions. | 16 | CO3 | BT2, BT3 | 4.1.1,5.4.1,6.1.1 |
| | 3(B) | The OH – radical has a moment of inertia of $1.48\times10^{-47}$ kg m$^2$. Calculate its inter-nuclear distance. Also calculate its angular momentum and angular velocity for $l = 5$. Determine the energy absorbed in transition from $l = 5$ to $l = 6$. | 4 | CO3 | BT3 | 4.1.1,5.4.1,6.1.1 |
| | Q4(A) | Use Schrodinger equation for a linear harmonic oscillator to obtain its eigen- values and eigen-functions. | 15 | CO3 | BT2, BT3 | 4.1.1,5.4.1,6.1.1 |
| | 4(B) | The force constant of a vibrating CO molecule is 1870 N/m. Find the energy difference between lowest and first excited vibrational level of CO. Given: $N_A = 6.02\times10^{23}$; $h = 6.6\times10^{-34}$ Js. Is the molecule likely to be found in the first excited vibrational level at room temperature? | 5 | CO3 | BT3 | 4.1.1,5.4.1,6.1.1 |
| PART-D | Q5 | A particle with energy E is approaching a potential step with potential function $V = V_0$ for $0 < x$ and zero when $x < 0$. Determine the values of reflection and transmission coefficients for $E > V_0$ & $E < V_0$ | 20 | CO4 | BT2, BT3 | 4.1.1,5.4.1,6.1.1, 8.1,10.1, 11.1 |
| | Q6 | A beam of particles with energy E is incident on a potential barrier with potential function $V = V_0$ for $0 < x < a$ and zero elsewhere. Determine the expression for transmission coefficient if $E < V_0$ and hence show that it decreases exponentially with the increase in the width of the barrier. | 20 | CO4 | BT2, BT3 | 4.1.1,5.4.1,6.1.1, 8.1,10.1, 11.1 |

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## DEPARTMENT OF PHYSICS

"T3 Examination, December-2021"

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|---|---|---|---|
| SEMESTER | III-rd | DATE OF EXAM | 06-12-2021 |
| SUBJECT NAME | Electromagnetic theory | SUBJECT CODE | PHH203B-T |
| BRANCH | Physics | SESSION | Morning |
| TIME | 09.00AM - 12.00AM | MAX. MARKS | 100 |
| PROGRAM | BSc | CREDITS | 4 |
| NAME OF FACULTY | Dr. Sandeep Kumar | NAME OF COURSE COORDINATOR | Dr. Sandeep Kumar |

*Note: All questions are compulsory. Question 6 has choice.*

| | Q.NO. | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A&B | Q1 | If vector $\vec{E} = 3a_y + 4a_z$ and vector $\vec{F} = 4a_x - 10a_y + 5a_z$ (a) Find the component of $E$ along $F$ (b) Determine the unit vector perpendicular to both $\vec{E}$ and $\vec{F}$. | 10 | CO1 | BT1, BT2, BT3 | 1.1.1, 1.3.1, 2.1.1, 2.2.2, 4.1.1, 6.2.1 |
| | Q2 | Write down the Maxwell equation for static EM fields as well as for time varying fields. Discuss their physical significance also. | 10 | CO2 | BT1, BT2, BT3 | 1.1.1, 1.3.1, 2.1.1, 2.2.2, 4.1.1, 6.2.1 |
| PART-C | Q3 | Discuss the plane wave propagation in lossless dielectrics. Calculate the electric field and magnetic field and intrinsic impedance in lossless dielectrics | 20 | CO3 | BT1, BT3, BT4 | 1.1.1, 1.3.1, 2.1.1, 2.2.2, 4.1.1, 6.2.1 |
| | Q4 | In free space ($z \leq 0$), a plane wave with $\vec{H} = 10cos(10^8 t - \beta z)\, a_x$ mA/m is incident normally on a lossless medium ($\varepsilon = 2\varepsilon_0, \mu = 8\mu_0$) in region $z \geq 0$. Determine the reflected wave $H_r, E_r$ and the transmitted wave $H_t, E_t$. | 20 | CO3 | BT2, BT3, BT4 | 1.1.1, 1.3.1, 2.1.1, 2.2.2, 4.1.1, 6.2.1 |
| PART-D | Q5 | Construct the L-type equivalent circuit model of a two conductor transmission line. Obtain the solution of V and I using Kirchhoff's law. Calculate the expression for characteristic impedance of the circuit model. | 20 | CO4 | BT1, BT3, BT4 | 1.1.1, 1.3.1, 2.1.1, 2.2.2, 4.1.1, 6.2.1 |
| | Q6 | An airline has characteristic impedance of 70 Ω and phase constant of 3 rad/m at 100 MHz. Calculate the inductance per meter and the capacitance per meter of the line.<br>**OR**<br>A transmission line operating at 500 MHz has $Z_0 = 80\ \Omega$, $\alpha = 0.04$ Np/m, $\beta = 1.5$ rad/m. Find the line parameters R, L, G, and C | 20 | CO4 | BT2, BT3, BT4 | 1.1.1, 1.3.1, 2.1.1, 2.2.2, 4.1.1, 6.2.1 |

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## DEPARTMENT OF PHYSICS

*"T3 Examination, December-2021"*

| | | | |
|---|---|---|---|
| SEMESTER | III | DATE OF EXAM | 09.12.2021 |
| SUBJECT NAME | Mathematical Physics III | SUBJECT CODE | PHH202B-T |
| BRANCH | Physics | SESSION | I |
| TIME | 09:00AM – 12:00PM | MAX. MARKS | 100 |
| PROGRAM | B. Sc. | CREDITS | 4 |
| NAME OF FACULTY | Dr. Sarvesh Kumar | NAME OF COURSE COORDINATOR | Dr. Sarvesh Kumar |

*Note: All questions are compulsory from Part A, B, C and D.*

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A | 1(A) | Use Cauchy's integral formula to evaluate $\int_C \frac{z}{z^2-3z+2}\,dz$, where C is the circle $\lvert z-2\rvert=\frac{1}{2}$. | 5 | CO1 | BT3 | 2.2.1, 2.3.1 |
| | 1(B) | Find the Laurent Series expansion of $f(z)=\frac{1}{(z+1)(z+3)}$ for $\lvert z\rvert > 3$. | 5 | CO1 | BT4 | 2.2.1, 2.3.1 |
| PART-B | 2(A) | Express the function $f(x)=\begin{cases}1, & when\ \lvert x\rvert \le 1\\ 0, & when\ \lvert x\rvert > 1\end{cases}$ As a Fourier integral. Hence evaluate $\int_0^\infty \frac{\sin\lambda\cos\lambda x}{\lambda}\,d\lambda$ | 5 | CO2 | BT3 | 2.2.1, 2.3.1, 5.4.1 |

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| 2(B) | Obtain Fourier Cosine transform of $f(x) = \begin{cases} x, & for \quad 0 < x < 1 \\ 2 - x, & for \quad 1 < x < 2 \\ 0, & for \quad x > 2 \end{cases}$ | 5 | CO2 | BT4 | 2.2.1, 2.3.1, 5.4.1 |
| 3(A) | A problem of statistics is given to three students A, B and C, whose chances of solving it are ½, ¾ and ¼ respectively. What is the probability that the problem will be solved? | 5 | CO3 | BT3 | 2.3.1, 5.4.1, 10.2.1 |
| 3(B) | Find the Binomial distribution, whose mean is 5 and variance is 10/3. | 5 | CO3 | BT4 | 2.3.1, 5.4.1, 10.2.1 |
| 4 | If 10% of bolts produced by a machine are defective. Determine the probability that out of 10 bolts, chosen at random (i) 1; (ii) none; (iii) at most 2 bolts will be defective. | 10 | CO3 | BT3 | 2.3.1, 5.4.1, 10.2.1 |
| 5(A) | An urn I contains 3 white and 4 red balls and an urn II contains 5 white and 6 red balls. One ball is drawn at random from one of the urns and is found to be white. Find the probability that it is was drawn from urn I. | 4 | CO3 | BT3 | 2.3.1, 5.4.1, 10.2.1 |
| 5(B) | Using Poisson distribution, find the probability that the ace of spades will be drawn from a pack of well-shuffled cards at least once in 104 consecutive trails. | 6 | CO3 | BT3 | 2.3.1, 5.4.1, 10.2.1 |
| 6(A) | The diameter of an electric cable is assumed to be continuous random variate with probability density function: $f(x) = 6x(1-x), \ 0 \le x \le 1$ (i) Verify that above is probability density function. (ii) Find the mean and variance. | 5 | CO3 | BT3 | 2.3.1, 5.4.1, 10.2.1 |

PART C


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| | | | | | | |
|---|---|---|---|---|---|---|
| | 6(B) | In a male population of 1000, the mean height is 68.16 inches and standard deviation is 3.2 inches. How many men may be more than 72 inches? [Given that $P(z \geq 1.2) = 0.115$ and $z = (x - \mu) / \sigma$]. | 5 | CO3 | BT4 | 2.3.1, 5.4.1, 10.2.1 |
| PART-D | 7 (A) | Let G be a finite group. Show that there exists a positive integer n such that $a^n = e$ for all $a \in G$. | 5 | CO4 | BT2 | 2.2.1, 2.3.1, 10.2.1 |
| | 7(B) | If the group G has three elements, show it must be abelian. | 5 | CO4 | BT2 | 2.2.1, 2.3.1, 10.2.1 |
| | 8 | Solve the differential equations<br>(i) $\left(\frac{dy}{dx}\right)^2 - 7\frac{dy}{dx} + 10 = 0$<br>(ii) $y + x\frac{dy}{dx} = x^4\left(\frac{dy}{dx}\right)^2$ | 10 | CO4 | BT3 | 2.2.1, 2.3.1, 10.2.1 |
| | 9 | Solve the differential equations<br>(i) $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$<br>(ii) $x^2(y - px) = yp^2$, where $p = \frac{dy}{dx}$ | 10 | CO4 | BT3 | 2.2.1, 2.3.1, 10.2.1 |
| | 10(A) | Write short note on fractals. | 5 | CO4 | BT2 | 14.3.1 |
| | 10(B) | Write the notation used by the Einstein for the summation of $a_1x_1 + a_2x_2 + a_3x_3 + \ldots\ldots + a_nx_n$ in tensor analysis. If $f = f(x^1, x^2, x^3, x^4, \ldots\ldots x^n)$ then show that $df = \frac{\partial f}{dx^i} dx^i$. | 5 | CO4 | BT2 | 2.3.1, 5.4.1 |

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**DEPARTMENT OF PHYSICS**
*"T3 Examination, DEC-2021"*

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|---|---|---|---|
| SEMESTER | III | DATE OF EXAM | 04.12.2021 |
| SUBJECT NAME | NUCLEAR AND PARTICLE PHYSICS | SUBJECT CODE | PHH601B |
| BRANCH | PHYSICS | SESSION | I |
| TIME | 09:00-12:00AM (3Hrs) | MAX. MARKS | 100 |
| PROGRAM | M. Sc. | CREDITS | 4 |
| NAME OF FACULTY | Dr. ANSHUMAN SAHAI | NAME OF COURSE COORDINATOR | Dr. ANSHUMAN SAHAI |

*Note All questions are compulsory*

SET B

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PO |
|---|---|---|---|---|---|---|
| PART-A | 1 | Derive the relation for Larmour frequency and space quantization | 5+5 | CO1 | BT3 | 1.1.1 |
| PART-B | Q2(A) | Show that nuclear forces are spin dependent and it favors S=1 | 5 | CO2 | BT3 | 2.2.1 |
| | 2(B) | Prove that: $s_p.s_n=-3\hbar^2/4$ | 5 | CO2 | BT3 | 7.5.1 |
| PART-C | Q3(A) | Explain the process of α-decay on the basis of N-Z curve and Q value equations. Also evaluate the equation for K. E. of daughter nuclei for A>150. Show that for A>200, 98% of the energy will be taken by α-particle. | 4+8+4 | CO3 | BT3, BT5 | 1.1.1, 7.5.1 |
| | 3(B) | On the basis of experimental evidence of Q varying as a function Z, explain Gamow Theory for α-decay while comparing it how it was different from that of SEMF alone. | 4 | CO3 | BT3 | 1.1.1, 7.5.1 |
| | Q5(A) | Explain γ decay. How is it different from α-decay and β decay? Explain Mossbauer Spectroscopy and its principles based on recoil of nuclei and resonance. | 2+2+8 | CO3 | BT3 | 9.3.1, 9.2.1, 9.4.1 |
| | 5(B) | Complete the reactions:<br>(i) ${}^{6}_{3}Li + ? \rightarrow {}^{7}_{4}Be + {}^{1}_{0}n$<br>(ii) ${}^{35}_{17}Li + ? \rightarrow {}^{32}_{16}S + {}^{4}_{2}He$<br>(iii) ${}^{7}_{4}Be + {}^{4}_{2}He \rightarrow 3{}^{4}_{2}He + ?$<br>(iv) ${}^{79}_{35}Br + {}^{2}_{1}H \rightarrow ? + 2{}^{1}_{0}n$ | 8 | CO3 | BT5 | 9.3.1, 9.2.1, 9.4.1 |
| PART-D | Q6 | Write the composition of hadrons based on quarks model (i) $\pi^+$, (ii) $p^+$, (iii) $K^+$, (iv) $n^0$, (v) $\Omega$ | 20 | CO4 | BT5 | 9.3.1, 9.2.1, 9.4.1 |
| | Q7(A) | Show that the pion decay, muon decay and pair production conserve the lepton number $L_e$ and $L_\mu$ | 4 | CO4 | BT5 | 9.3.1, 9.2.1, 9.4.1 |
| | 7(B) | A μ muon collides with a proton and a neutron plus another particle is created. What is the other particle | 4 | CO4 | BT5 | 9.3.1, 9.2.1, 9.4.1 |
| | 7(C) | A negative kaon collides with a proton and a positive kaon and another particle are created. What is the other particle | 4 | CO4 | BT5 | 9.3.1, 9.2.1, 9.4.1 |

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| | 7(D) | Why must the quark in a hardon have different colors? Would they have to have different colors if their spins were 0 or 1 rather than ½? | 4 | CO4 | BT5 | 9.3.1; 9.2.1; 9.4.1 |
| | 7(E) | A member of the Σ group particle consists of two u quarks and one s quark. What is its charge? | 4 | CO4 | BT5 | 9.3.1; 9.2.1; 9.4.1 |

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## DEPARTMENT OF PHYSICS

"T3 Examination, December-2021"

| | | | |
|---|---|---|---|
| SEMESTER | III[rd] | DATE OF EXAM | 06-12-2021 |
| SUBJECT NAME | Electrodynamics and Plasma Physics | SUBJECT CODE | PHH602B |
| BRANCH | Physics | SESSION | Morning |
| TIME | 9.00AM - 12.00AM | MAX. MARKS | 100 |
| PROGRAM | MSc | CREDITS | 4 |
| NAME OF FACULTY | Dr. Sandeep Kumar | NAME OF COURSE COORDINATOR | Dr. Sandeep Kumar |

*Note. All questions are compulsory. Question 6 has choice.*

| | Q.NO. | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A&B | Q.1 | Derive and explain Poisson and Laplace's equation. | 10 | CO1 | BT1, BT3 | 1.1.1, 2.1.1, 2.2.1, 4.1.1 |
| | Q.2 | With the help of Maxwell's equation, obtain the field expressions in terms of scalar and vector potentials. | 10 | CO2 | BT1, BT3 | 1.1.1, 2.1.1, 2.2.1, 4.1.1 |
| PART-C | Q.3 | Deduce an expression for Larmor's formula for a **non-relativistic** accelerated charge. | 20 | CO3 | BT1, BT4 | 1.1.1, 2.1.1, 2.2.1, 4.1.1 |
| | Q.4 | Show that the electric and magnetic fields can be combined into a single entity called field tensor which is an antisymmetric second-rank tensor. Is this tensor gauge invariant ? | 20 | CO3 | BT2, BT4 | 1.1.1, 2.1.1, 2.2.1, 4.1.1 |
| PART-D | Q.5 | What are the plasma Oscillation? Deduce an expression for plasma frequency with the help of mass conservation of continuity. | 20 | CO4 | BT2, BT3, BT4 | 1.1.1, 2.1.1, 2.2.1, 4.1.1 |
| | Q.6 | Explain hydrodynamical description of plasma. Establish the equation of magnetohydrodynamics.<br>**OR**<br>Compute $\lambda_D$ and $N_D$ for the following cases: (a) glow discharge with $n = 10^{16}\ m^{-3}$, $KT_e = 2\ eV$, (b) The earth's ionosphere, with $n = 10^{12}\ m^{-3}$, $KT_e = 0.1\ eV$. (c) A $\theta$-pinch, with $n = 10^{23}\ m^{-3}$, $KT_e = 800\ eV$. | 20 | CO1 | BT2, BT3, BT4 | 1.1.1, 2.1.1, 2.2.1, 4.1.1 |

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## DEPARTMENT OF PHYSICS

*"T3 Examination, December-2021"*

| | | | |
|---|---|---|---|
| SEMESTER | 3rd | DATE OF EXAM | 8.12.2021 |
| SUBJECT NAME | Advanced Solid-State Physics | SUBJECT CODE | PHH603B |
| BRANCH | Physics | SESSION | 0 |
| TIME | 9:00-12:00 NOON | MAX. MARKS | 100 |
| PROGRAM | M. Sc. | CREDITS | 4 |
| NAME OF FACULTY | Dr. Deepti | NAME OF COURSE COORDINATOR | Dr. Deepti |

*Note: All questions are compulsory. Use of scientific calculator is allowed during the exam.* *[SET –B]*

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART A | 1 | Discuss the various conclusions derived from the K-P equation, by giving its plot. Also discuss the physical interpretation of effective mass. | 5+5 | CO1 | BT4 | 4.1.1, 11.1.1 |
| PART B | 2 | A spherical conductor of radius a is immersed in a plasma and charged to a potential $\phi_0$ The electron remains Maxwellian and move to form a Debye shield, but the ions are stationary during the time frame of experiment. Assuming $\phi_0 \ll KT_e/e$, derive an expression for the potential as a function of $r$ in terms of $a$, $\phi_0$ and $\lambda_D$, assuming the solution of the form $e^{-kr/r}$. | 10 | CO2 | BT5 | 2.1.1, 4.1.1 |
| PART C | 3 | Obtain Claussius -Mosotti equation and explain how it can be used to determine the dipole moment of a polar molecule from the dielectric constant measurement. For a dielectric material $\epsilon_r$ =4.94, $n^2$=2.69, where n is the index of refraction. Calculate the ratio between electronic and ionic polarisabilities of this material. | 10+5+5 | CO3 | BT3, BT4, BT5 | 4.1.1, 11.1.1 |
| | 4 | Discuss in detail the dielectric polarization in presence of alternating electric field. Explain the term complex dielectric constant and dielectric loss. Discuss their significance and sketch the variation of total polarizability of an atom as a function of frequency. | 10+5+5 | CO3 | BT4 | 2.1.1, 4.1.1, 11.1.1 |
| PART D | 5 | Describe Heisenberg's interaction of the origin of Weiss molecular field. Relate the exchange integral to the Weiss constant and ferromagnetic Curie temperature. A magnetic material has a magnetization 3300A/m and flux density of 0.0044W/m$^2$.Calculate the magnetic field and relative permeability of the material. | 10+5+5 | CO4 | BT4, BT5 | 2.1.1, 4.1.1, 11.1.1 |
| | 6 | What is antiferromagnetic state? Describe two sublattice model and show that it leads to a transition temperature equal to the constant $T_c$ in the Curie -Weiss law. | 5+10+5 | CO4 | BT4, BT5 | 2.1.1, 4.1.1, 11.1.1 |

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# DEPARTMENT OF PHYSICS

*"T3, Examination 2021"*

**Semester:** 3rd
**Subject:** Fundamental Atmospheric Physics
**Branch:** Physics
**Course Type: CORE**
**Time:** 3 Hours
**Max. Marks:** 100

**Date of Exam:** 10/12/2021
**Subject Code:** PHH604B
**Session:** I
**Course Nature: Hard**
**Program: M. Sc.**
**Signature: HOD/Associate HOD:**

*Note: All questions are compulsory.*

## PART-A

Q1. What are the differences between green house effect and enhanced green house effect and describe the elements of weather and climate of India. (10)

## PART-B

Q2. Discuss the Beer-Lambert law and prove that intensity of incident light decreases exponentially with depth in the material. (10)

## PART-C

Q3. Discuss in detail the various types of atmospheric pollutions and their sources and removal process. (20)

Q4. What are the primary and secondary pollutants? Discuss the air pollution and their effect on human health. (20)

## PART-D

Q5. What are atmospheric aerosols? Discuss their sources, size and direct effect of climate. (20)

Q6. Discuss the atmospheric aerosol removal processes and explain the aerosol-cloud interaction. (20)



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## DEPARTMENT OF PHYSICS

*"T3 Examination, Dec-2021"*

| | | | |
|---|---|---|---|
| **SEMESTER** | **III** | **DATE OF EXAM** | **09/12/2021** |
| **SUBJECT NAME** | **Electricity and Electromagnetism** | **SUBJECT CODE** | **PHH226-T** |
| **BRANCH** | **Physics** | **SESSION** | **Morning (9am-12)** |
| **TIME** | **3 hrs** | **MAX. MARKS** | **80** |
| **PROGRAM** | **B.Sc B.ED** | **CREDITS** | |
| **NAME OF FACULTY** | **Dr. Shiv Kumar Dixit** | **NAME OF COURSE COORDINATOR** | **Dr. Shiv Kumar Dixit** |

*Note: All questions are compulsory.*

*Set B*

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A | 1(A) | Define magnetic scalar ($V_m$) and vector potential (A) with its unit and prove the following $\nabla.B = 0$. | 5 | CO3 | L1 | |
| | 1(B) | Define magnetic susceptibility and permeability with its unit and derive an expression for force on a current element of a current carrying conductor due to magnetic field. | 5 | CO3 | L3 | |
| | 1(C) | Derive the expression for magnetic dipole moment and torque of a current carrying loop. | 5 | CO3 | L2 | |
| | 1(D) | Define the following:<br>(i) Faraday's law of electromagnetic induction.<br>(ii) Mutual inductance with its units.<br>(iii) Self Inductance<br>(iv) Resonance | 5 | CO3 | L2 | |
| PART-B | Q2 | Derive an expression for measurement of electric flux density (D) of uniformly charged sphere for both cases. | 10 | CO3 | L1 | |
| | Q3 | Derive an expression for capacitance and resistance of a parallel plate and spherical capacitor. | 10 | CO3 | L3 | |
| PART-C | Q4 | Derive an expression for magnetic energy and energy density in a magnetostatic field. | 10 | CO4 | L4 | |
| | Q5 | Derive an expression using Faraday's law for induced emf due to (a) Moving loop in static field (b) Moving loop in time varying field. | 10 | CO3 | L2 | |
| | Q6 | (i) Define a transformer? Explain its working with diagram<br>(ii) Define the following (a) Reactance (b) Impedance (c) RMS value (d) Power factor (e) Phase angle in current and voltage in LCR series circuit | 5+5 | CO4 | L2 | |
| | Q7 | (i) A parallel plate capacitor with plate area of 5cm² and plate separation of 1mm has a voltage 50 Sin 10⁴ t Volt applied to its plates. Calculate the displacement current assuming $\varepsilon_r = 2\varepsilon_0$<br>(ii) Derive the relation $B = \mu H$. | 5+5 | CO4 | L1 | |

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**DEPARTMENT OF MANAGEMENT**

*"T3 Examination, Dec-2021"*

| | | | |
|---|---|---|---|
| **SEMESTER** | - III | **DATE OF EXAM** | 13/12/2021 |
| **SUBJECT NAME** | **Basics of Economics** | **SUBJECT CODE** | **MCS 231** |
| **BRANCH** | ~~BA~~ B.Ed, ~~B.Sc. Physics~~, ~~B.Sc. Mathematics~~ | **SESSION** | **Morning** |
| **TIME** | **9:00-10:30 am** | **MAX. MARKS** | **40** |
| **PROGRAM** | **BA B.Ed, ~~B.Sc. Physics~~, ~~B.Sc. Mathematics~~** | **CREDITS** | **2** |
| **NAME OF FACULTY** | **Srishti Bathla** | **NAME OF COURSE COORDINATOR** | **Srishti Bathla** |

Pragati

| Q.NO. | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL |
|---|---|---|---|---|
| Q1 | Will the first slice of pizza give you the same amount of satisfaction/ utility as the third slice of pizza? Why/ Why not? Explain the law behind it with the help of example | 5 | CO1 | L3 |
| Q2 | You bought some FMCG goods from the market worth Rs. 2000. Which type of market do these goods belong? What are the other types of markets in an economy? Distinguish between them with the help of some real-life examples | 5 | CO4 | L3 |

| | | | | |
|---|---|---|---|---|
| Q3 | What law of production applies in the long run? Explain the laws in detail | 5 | CO3 | L2 |
| Q4 | The Market Demand for a good at Rs. 10 per unit is 100 units. Due to increase in price, the market demand falls to 60 units. Find out the new price if the price elasticity of demand is (-)4. | 5 | CO2 | L3 |
| Q5 | What are the factors affecting the Supply of a commodity. Explain the factors with the help of examples. | 5 | CO4 | L2 |
| Q6 | The demand of 'salt' does not change with the change in its price. Why? Explain the reason with graphic representation. | 5 | CO2 | L1 |
| Q7 | Indian Economy is facing a fall in its GDP. What do you think must be reasons for the same? Comment. | 5 | CO1 | L5 |
| Q8 | Complete the table: (Fixed Cost is Rs. 100) | 5 | CO3 | L3 |

| Output | Total Variable cost | Marginal Cost | Total Cost | Average Fixed Cost | Average Variable cost | Average Total Cost |
|---|---|---|---|---|---|---|
| 0 | 0 | | | | | |
| 1 | 60 | | | | | |
| 2 | 90 | | | | | |
| 3 | 110 | | | | | |
| 4 | 150 | | | | | |
| 5 | 230 | | | | | |
| 6 | 350 | | | | | |
| 7 | 510 | | | | | |
| 8 | 710 | | | | | |

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## DEPARTMENT OF MANAGEMENT

*"T3 Examination, Dec-2021"*

| | | | |
|---|---|---|---|
| SEMESTER | III | DATE OF EXAM | 13/12/2021 |
| SUBJECT NAME | INTODUCTION TO FINANCE | SUBJECT CODE | MCS232 |
| BRANCH | [redacted], B Ed. [redacted] | SESSION | MORNING |
| TIME | 9:00-10:30 am | MAX. MARKS | 40 |
| PROGRAM | [redacted], B Ed. [redacted] | CREDITS | 2 |
| NAME OF FACULTY | DR. RASHI BANERJI/ DR. POOJA KAPOOR | NAME OF COURSE COORDINATOR | DR. RASHI BANERJI/ DR. POOJA KAPOOR |

| Q.NO. | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL |
|---|---|---|---|---|
| Q1(A) | Explain its features, merits and demerits of sole proprietorship? | 5 | CO1 | L1 |
| Q1(B) | Why banks are called financial intermediaries? What are the three roles of financial intermediaries? | 5 | CO1 | L2 |
| Q2(A) | Why analysis of financial statements is important? Give example/format of the three financial statements. | 5 | CO2 | L1 |
| Q2(B) | Explain the significance of Break Even Analysis with the help of a graph? | 5 | CO2 | L2 |
| Q3(A) | What are the differences between equity and preference capital? What is the cost of capital incurred through raising these capitals? | 5 | CO3 | L3 |
| Q3 (B) | Explain the advantages and disadvantages of raising capital from Debentures.? | 5 | CO3 | L2 |
| Q 4 (A) | Why the consideration of time value of money is important in financial decision making? | 5 | CO4 | L3 |
| Q4 (B) | What is the importance of capital budgeting decisions in long term decision making of a firm? | 5 | CO4 | L3 |

*******

MANAV RACHNA
(vidyanokarbhav)

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NAAC ACCREDITED B GRADE INSTITUTION
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Name :
Roll No :
Class/Sec :

# DEPARTMENT OF FOREIGN LANGUAGE

*T3 Examination, December 2021"*

*Paper ID:.....*

**Semester:** 3rd & 7th
**Subject:** Spanish - I
**Time:** 90 Minutes
**Program:** B.Tech / B.ed / Law / B.Sc / BBA
**Invigilator Signature:**

**Date of Exam:** 7/12/2021
**Subject Code:** FLS101
**Max.Marks:** 40
Session - I
**Signature: HOD/Associate HOD:**

*Note: All questions are compulsory.*

**Ques. 1** **Escribe diez líneas sobre ti mismo, tu familia, tu clase etcétera usando nombre/ adjetivo/ nacionalidad/ profesión/ edad etcétera.** **(8)**
**Write 10 sentences about yourself, your family, your class etc. using name/adjective/nationality / profession/ age/ etc..)**

**Ques. 2 Lee el texto y responde las preguntas.** **(6)**
**Read the text and respond to the questions.**

¡Hola! ¡Buenas tardes! Me llamo Rahul, soy indio pero vivo en Francia con mis amigos. Yo tengo 34 años y soy profesor de matemáticas en la escuela Mi número de teléfono es 9393939. Tengo (I have) un amiga en Francia que se llama Eva. Ella es de China, es china, Eva tiene 20 años y es doctora. Tengo otros amigos que son jugadores, ingenieros y profesores. Nosotros vivimos en una casa muy grande. Gracias, ¡chao!

a. ¿Es Rahul de Francia? Verdadero o falso- _____
b. ¿Cuántos años tiene la amiga de Rahul?
_____
c. ¿Cuál es la profesión de Eva?
_____
d. ¿Dónde vive Eva?
_____
e. ¿Cuáles las profesiónes de otros amigos de Raúl?
_____
f. Escribe el contrario (opposite) de grande. _____.

**Ques.3 Completa las frases con adjetivo posesivo.** **(4)**
**Complete the phrases with adjective possessive.**

e.g. (Ellas)_____ coche es pequeño. Su coche es pequeño.

a. (Yo) _____ casa es nueva.

b. (Nosotros) _____ universidad es grande.

c. (Usted) _____ ordenador es pequeño.

d. (Ellas) _____ televisión es vieja.

e. (Vosotras) _____ hijas son inteligentes.

f. (Ustedes) _____ libros son interesantes.

g. (Él) _____ profesora de español es simpática.

h. (Tú) _____ perro es muy activo.

**Ques. 4 Traduce (translate):-** **(6)**

Escribe en inglés o español. Write in English or Spanish.

a. Este es mi hermano, es australiano.
_____.

b. Hay 4 ventanas en la clase.
_____.

c. Tengo clases de español los lunes, los miércoles y los domingos.

_____.

d. That book is blue and red.

_____.

e. Her cousin sister is a lawyer.

_____.

f. My father's car is black and grey

_____.

**Ques. 5 Completa con la forma adecuada de los verbos.** **(4)**

**Complete with the appropriate form of AR, ER and IR ending verbs.**

a. Ustedes _____(hablar) español.

b. Ella _____ (vivir) en España.

c. Vosotros _____ (leer) la conjugación.

d. Nosotros _____ (escribir) una carta.

e. Yo _____ (aprender) lingua extranjera.

f. Usted _____ (escuchar) canción.

g. Tú _____ (comer) hamburguesa.

h. Ellas _____(trabajar) en colegio.

**Ques. 6 Escribe los números en español.** **(4)**

**Write numbers in Spanish.**

a. 56-

b. 23-

c. 11

d. 100-

e. 57-

f. 93-

g. 16-

h. 44

(4)

**Ques. 7 Relaciona los meses, días y estaciones a inglés.**
**Match months, days and seasons.**

| | |
|---|---|
| a. Invierno | October |
| b. Octubre | January |
| c. Miercoles | Autumn |
| d. Jueves | Winter |
| e. Otoño | Wednesday |
| f. Domingo | Spring |
| g. Primavera | Thursday |
| h. Enero | Sunday |

**Ques. 8 Elige la opción correcta:**
**Choose the correct option** (4)

| | | | | |
|---|---|---|---|---|
| a. | i. Un coche | ii. Una coche | iii. Uno coche | iv. Unas coches |
| b. | i. Unas casos | ii. Unas casas | iii. Unos cacos | iv. Uno casa |
| c. | i. El perra | ii. La perro | iii. El perro | iv. El perros |
| d. | i. Las silas | ii. Las cilas | iii. Las sillas | iv. Los sillas |
| e. | i. La ordenador | ii. Las ordenadores | iii. Lo ordenadore | iv. El ordenador |
| f. | i. Una planta | ii. Un planta | iii. Las planta | iv. Los plantes |
| g. | i. Un madre | ii. Una madre | iii. Los madres | iv. El madre |
| h. | i. Unos niños | ii. Unas niños | iii. Los niño | iv. Las niños |

***Buena Suerte***

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Vidyanatarikshi

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**DEPARTMENT OF FOREIGN LANGUAGES**
**T3 EXAMINATION, DECEMBER 2021**
*Paper ID:* .....

**Semester:** 3rd & 7th
**Subject:** German - I
**Time:** 90 Minutes
**Program:** All
**Invigilator Signature:**

**Date of Exam:** 07/12/2021
**Subject Code:** FLS102
**Max.Marks:** 40 Session - I
**Signature: HOD/Associate HOD:**

*Note: All questions are compulsory.*

Roll number:_____ Name : _____

Class / Sec _____

**I. Schreiben Sie das Datum auf Deutsch.**
**(Write the date in German.)** **[5]**

a) 25.04 _____

b) 01.02 _____

c) 31.12 _____

d) 24.09 _____

e) 03.05 _____

**II. Schreiben Sie richtig.**
**(Frame the correct sentences.)** **[5]**

a) spielt - Er - gern - Tennis. _____

b) Ich - gehe - in das Theater - . _____

c) heißen - Sie - Maria – . _____

d) kommen - Woher - Sie - ? _____

e) spielen - Wir - jeden Tag - . _____

**III.** **Schreiben Sie 5 Sätze über Ihr Lieblingshobby.**
**Write 5 sentences about your favourite hobby.** **[5]**

_____.

_____.

_____.

_____.

_____.

**IV.** **Konjugieren Sie die Verben.**
**Conjugate the verbs.** **[5]**

a) Ben _____ ins Theater. (gehen, geht, gehe)

b) Karin _____ mit meinem Hund. (spielen, spielt, spiele)

c) _____ ihr um 8.00 Uhr nach Italien? (fliegen, fliegt, fliege)

d) Wir _____ sehr gut Deutsch. (sprechen, sprichst, spricht)

e) _____ Anna und Mark „Secret of Life''? (lesen, lest, lese)

f) _____ du Taj Mahal? (sehen, siehst, sehe)

g) _____ Sie bei Microsoft, Herr Meier? (arbeitet, arbeiten, arbeite)

h) Ich _____ in Tokyo. (wohnen, wohne, wohnt)

i) Meine Mutter _____ 50 Jahre alt. (ist, seid, bin)

j) Er _____ Martin. (heißt, heißen, heiße)

**V.** **Schreiben Sie den bestimmten Artikeln 'der', 'die' oder 'das'.**
**Write the definite articles 'der', 'die' or 'das'.** **[5]**

a) _____ Stift

b) _____ Sofa

c) _____ Stuhl

d) _____ Tasse

e) _____ Brille

f) _____ Computer

g) _____ Buch

h) _____ Kaffee

i) _____ Bett

j) _____ Ventilator

**VI. Wie spät ist es? (Offizielle Zeit)**
**What time is it? (Write in the official format)** **[5]**

a) 04.00 Uhr _____

b) 5.10 Uhr _____

c) 12.45 Uhr _____

d) 15.00 Uhr _____

e) 7.33 Uhr _____

**VII. Übersetzen Sie ins Deutsch!**
**Translate the given sentences into German!** **[5]**

a) I play football.

_____.

b) She is a teacher.

_____.

c) He drinks coffee.

_____.

d) I speak English.

_____.

e) We belong to Delhi.

_____.

**VIII. Ergänzen Sie!**
**Translate the given words accordingly!** **[5]**

| Englisch | Deutsch |
|---|---|
| Italy | |
| | Spanien |

| | |
|---|---|
| Boxing | |
| Volleyball | |
| | Mittwoch |
| | Guten Tag |
| Winter | |
| | Herbst |
| January | |
| | Juli |

Name :

Roll No :

Class/ Sec :

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vidyaprabha

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**DEPARTMENT OF FOREIGN LANGUAGES**
**T3 EXAMINATION, December 2021**
*Paper ID:.....*

**Semester:** 3rd & 7th
**Subject:** French - I
**Time:** 90 Minutes
**Program:** B.Tech / B.ed / Law / B.Sc / BBA
**Invigilator Signature:**

**Date of Exam:** 7/12/2021
**Subject Code:** FLS103
**Max.Marks:** 40 Session - I
**Signature: HOD/Associate HOD:**

***Note:*** *All questions are compulsory.*

**Section-A**
**(COMPRÉHENSION ÉCRITE)**

**I. Lisez le passage et répondez aux questions**
(Read the passage and answer to the questions)

Aujourd'hui c'est le premier jour de l'école ! Les élèves de l'école sont contents. Voilà la petite Caroline dans le cours de français. Elle est anglaise. Elle a quatorze ans. Elle est très belle. Son(Her) amie de la classe c'est Martha, elle est belge et elle a treize ans. Elle est grande et aussi belle. Elle joue au badminton avec Caroline. Elles aiment beaucoup la France. Le garçon s'appelle Jean-Pierre. Il est français. Il a quinze ans. Il habite à Strasbourg en Alsace. Il est sympathique. Il donne des bonbons à Caroline et Martha. Il parle en anglais et en français avec elles. Les trois sont bons amis.

**1. Dites vrai ou faux :** **(3)**
(True or False)

a) Martha est japonaise. _____
b) Caroline a 14 ans. _____
c) Les filles jouent au tennis. _____
d) Martha donne les bonbons. _____
e) Caroline est jolie. _____
f) Jean-Pierre parle anglais et français avec les filles. _____

**2. Répondez aux questions :** **(2)**
(Answer to the questions)

a) Où habite Jean-Pierre ?

_____

b) Quel âge a Martha ?

_____

## Section B
## Expression Écrite

**II. Présentez – vous (Present yourself)** **(5)**
Ou (Or)
**Décrivez votre ami(e)** (Describe your friend)

_____

_____

_____

_____

_____

_____

## Section - C
## Grammaire

**III. Complétez avec les articles définis** **(2.5)**
(Complete with definite articles)
(le /la/l'/les)

a) Ce sont _____ stylos de Pierre.
b) C'est _____ pupitre de cette classe.
c) _____ garçon est bon.
d) _____ hôtel est beau.
e) _____ femme est belle.

**IV. Complétez avec les articles indéfinis** **(2.5)**
(Complete with indefinite articles)
(un/une/des)

a) C'est _____ crayon.
b) Ce sont _____ trousses.
c) C'est _____ cravate.
d) J'ai _____ pantalon.
e) Il a _____ livre.

**V. Répondez aux questions :** **(2)**
(Answer to the questions)

a) Quel est le sixième jour de la semaine?

_____

b) Quel est le mois entre septembre et décembre ?

_____

**VI. Traduisez en français-** **(5)**
(Translate in French)

a) Good evening! _____
b) She watches television. _____
c) Thank you very much! _____
d) See you tomorrow! _____
e) He lives in Paris. _____

**VII. Complétez avec les verbes:** **(6)**
(Complete with the verbs)

a) Vous _____ (aller) à Delhi.
b) Nous _____ (avoir) une maison.
c) Elle _____ (jouer) avec le chat.
d) Ils _____ (parler) français.
e) Tu _____ (chanter) bien.
f) Ce _____ (être) des gommes

**VIII. Traduisez en francais:-** **(5)**
(Translate in French)

a) It's beautiful! _____

b) It's sunny! _____

c) It's cold! _____

d) It's hot! _____

e) It snows! _____

**(2)**

**IX. Quelle heure est-il ?**
(What time is it ?)

a) 8 : 25

_____

b) 5 : 45

_____

## Section-D
## Culture and Civilisation

**X. Complétez les phrases :** **(5)**
(Complete the sentences)

a) _____ est une ville française.
b) _____ est une fleuve française.
c) _____ est un fromage français.
d) _____ est une montagne française.
e) _____ est un vin français.

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**SET-A**

## DEPARTMENT OF PHYSICS

*"T3 Examination, December-2021"*

| | | | |
|---|---|---|---|
| SEMESTER | V | DATE OF EXAM | 02.12.2021 |
| SUBJECT NAME | Statistical Physics | SUBJECT CODE | PHH301B-T |
| BRANCH | Physics | SESSION | II |
| TIME | 1:00PM-4:00PM | MAX. MARKS | 100 |
| PROGRAM | B.Sc | CREDITS | 4 |
| NAME OF FACULTY | Haider Abbas | NAME OF COURSE COORDINATOR | Haider Abbas |

*Note: All questions are compulsory.*

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A | Q.1 | Calculate the number of states in energy range E to E+ ΔE. | 10 | CO1 | BT3 | 2.1.1, 2.3.1 |
| | Q.2 | Using Boltzmann equation, derive Saha's equation. | 10 | CO2 | BT3 | 2.2.1, 2.3.1 |
| -BPART | Q.3 | Using Bose-Einstein statistics derive Planck's law of radiation in terms of wavelength. | 10 | CO3 | BT6 | 2.2.1, 2.3.1,5.4.11 |
| | Q.4 | Derive Bose-Einstein statistics | 20 | CO3 | BT6 | 2.2.1, 2.3.1,5.4.11 |
| | Q.5 | Derive the expression for Bose-Einstein Condensation. **OR** Stating Stefan-Boltzmann law give its thermodynamics proof. | 10 | CO3 | BT6 | 2.2.1, 2.3.1,5.4.11 |
| CPART- | Q.6 | Evaluate the pressure and energy of the relativistic Fermi gas. | 20 | CO4 | BT6 | 2.2.1, 2.3.1,5.4.1 |
| | Q. 7 | Using the Fermi-Dirac distribution function, Derive a relation for Fermi energy. | 10 | CO4 | BT6 | 2.2.1, 2.3.1,5.4.11 |
| | Q. 8 | Stating the discrepancies with Einstein theory, apply the Debye's assumption to obtain the specific heats of solids at low and high temperature. **OR** Derive the expressions for pressure and kinetic energy density for a relativistic Fermi gas. | 10 | CO4 | BT6 | 2.2.1, 2.3.1,5.4.11 |

***END***

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## DEPARTMENT OF PHYSICS

*"T3 Examination, December 2021"*

| | | | |
|---|---|---|---|
| SEMESTER | V | DATE OF EXAM | 4-12-2021 |
| SUBJECT NAME | Modern Physics | SUBJECT CODE | PHH304B - T |
| BRANCH | Physics | SESSION | I[st] |
| TIME | 1-4 pm | MAX. MARKS | 100 |
| PROGRAM | B.Sc | CREDITS | |
| NAME OF FACULTY | Dr. Aditya Sharma | NAME OF COURSE COORDINATOR | Dr. Aditya Sharma |

[SET- A]

*Note: All questions are compulsory from Part A (Max. marks =20)*

**PART -A**

| S. No | Questions | Marks | C. O. | B.T. | P. I. |
|---|---|---|---|---|---|
| 1(a) | How fast would a rocket have to go relative to an observer for its length to be contracted 99% of its length at rest? | 5 | CO 1 | BT, 4 | 1.1, 2.1.1 |
| 1(b) | Derive Lorentz transformation equations for space and time. | 5 | CO 1 | BT2 , 3 | 1.2.1, |
| 1(c) | Calculate the first and second ionization potential of H atom | 5 | CO 2 | BT2 , BT3 | 1.2.1 |
| 1(d) | Apply the space quantization to estimate the direction and angle of $m_l$ for l =2. | 5 | CO 2 | BT3 | 1.2.1 |

**(PART -B** *(max. marks = 40)). Question 3 has an optional question.*

| S. No | Questions | Marks | C. O. | B.T. | P. I. |
|---|---|---|---|---|---|



PTO

| | | | | | |
|---|---|---|---|---|---|
| 1 | What is Raman Effect? Provide the experimental set-up details to observe the Raman effect. Derive mathematical expression for calculating total polarizability. Also demonstrate occurrence of the Stoke and anti-Stoke lines in term of Quantum mechanical treatment of Raman effect. | 2+8+7+3 =20 | CO3 | BT1, BT3, BT4 | 3.1.1, 1.2.1 |
| 2 | How the L and $\mu_l$ of a revolving electron make precession under the magnetic field? Estimate the frequency of this precision and prove that $\omega = e.B/2m$. | 5 + 10 = 15 | CO3 | BT4, 5 | 3.1.1, 1.2.1 |
| 3 | Describe the Space quantization and prove that $\cos\theta = m_l/\sqrt{l(l+1)}$. | 5 | CO3 | BT5, 4 | 2.2.1, 1.2.1 |
| or | Apply the spin quantum number and prove; $S_z = m_s . h/2\pi$ | 5 | CO3 | BT3, BT4 | 1.2.1 |

**PART -C** *(max. marks = 40). Question 4 has an optional question.*

| S.n | Questions | Marks | C. O | B.T. | P. I. |
|---|---|---|---|---|---|
| 1 | Calculate the average binding energy per nucleon of $_{28}Ni^{64}$ having 63.9280 u mass. | 5 | CO4 | BT1, BT2,3, | 3.1.1, 1.2.1 |
| 2 | Calculate the packing fraction and average binding energy per nucleon for $_8O^{16}$ of nuclear mass 15.994 u. | 5 | CO4 | BT1, BT2,3, | 3.1.1, 1.2.1 |
| 3 | If the number of nucleons in an oxygen nucleus is 16 and the number of nucleons in a copper nucleon is 64, how much larger is a copper nucleus than oxygen nucleus. | 10 | CO4 | BT3,4 | 3.1.1, 1.2.1 |
| 4 | Why do we need Nuclear Shell Model? What are the salient features of Shell Model? How the distribution of nucleons can be anticipated in Shell Model? Apply the shell model and evaluate magic numbers (at least first 3 magic numbers). | 20 | CO4 | BT3,4 | 3.1.1, 1.2.1 |
| Or | Demonstrate the, principle, construction and working of ionization chamber and estimate the voltage pulse it can produce. | 20 | CO4 | BT3,4 | 3.1.1, 1.2.1 |

PTO

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## DEPARTMENT OF PHYSICS

*"T3 Examination, December-2021"*

| | | | |
|---|---|---|---|
| SEMESTER | V[th] | DATE OF EXAM | 8.12.2021 |
| SUBJECT NAME | Condensed Matter Physics-I | SUBJECT CODE | PHH303B-T |
| BRANCH | Physics | SESSION | II |
| TIME | 1:00-4:00 P.M | MAX. MARKS | 100 |
| PROGRAM | B. Sc | CREDITS | 4 |
| NAME OF FACULTY | Dr. Deepti | NAME OF COURSE COORDINATOR | Dr. Deepti |

*Note: All questions are compulsory. Use of scientific calculator is allowed during the exam.* *[SET –A]*

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| | 1 | From X-rays data Fe is found to have cubic cell parameters of 2.87Å. Its density & atomic mass are 7870kg/m$^3$ & 55.85 respectively. Find out the Bravis lattice of Fe & interatomic separation of Fe atoms. | 5+5 | CO1 | BT2, BT3 | 1.2.1 |
| | 2 | A monoatomic simple cubic lattice with potential $U = \frac{1}{2}\alpha(r-r_0)^2 - \frac{1}{3}\beta(r-r_0)^3$, where $r_0 = 2.8Å$, $\alpha = 0.5\frac{eV}{A^2}$, $\beta = 0.1\frac{eV}{A^2}$ (i) Find the equilibrium lattice constant (ii) If X-rays of wavelength 2.8Å to be used then minimum angle that can be diffracted by powder sample of this crystal will be? | 5+5 | CO2 | BT5 | 2.1.2 |
| | 3 | How the acoustic branch, optic branch and forbidden gap originate from dispersion relation in a diatomic lattice. Plot the dispersion relation for diatomic lattice and depict the physical interpretation of all maxima and minima points on the optic and acoustic branch. | 5+10+5 | CO3 | BT2, BT3, BT4 | 1.2.1, 6.2.1,10 2.1,2.1 1,5.1.1 |
| | 4 | How does Debye's model differ from Einstein's model? Mention essential differences in the model and discuss the consequences of these differences. **OR** What is Einstein model for the phonon frequency distribution? Use this model to calculate the internal energy per Kmol for a solid (i) low temperature range (ii) high temperature range | 10+5+5 | CO3 | BT2, BT4, BT5 | 1.2.1, 6.2.1,10 2.1,2.1 1,5.1.1 |
| | 5 | Discuss the principle and working of XRD technique. What are its applications, strengths and limits? A BCC crystal is used to measure the wavelength of some X-rays. The Bragg angle for the reflection from (110) plane is 20.2$^0$. Calculate the wavelength of x-rays if lattice parameter of the crystal is 3.15Å. | 10+5+5 | CO4 | BT2, BT4, BT5 | 1.2.1, 6.2.1,10 2.1,2.1 1,5.1.1 |
| | 6 | What is NMR used for? Discuss its basic principle, theory and working. What are the drawbacks of this tool? **OR** Discuss the principle, construction and working of UV visible spectroscopy. What are its advantages and applications? | 5+10+5 | CO4 | BT2, BT3, BT5 | 1.2.1, 6.2.1,10 2.1,2.1 1,5.1.1 |

********** END **********

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MANAV RACHNA UNIVERSITY

Declared as State Private University vide Haryana Act 26 of 2014

## DEPARTMENT OF PHYSICS

*"T3 Examination, Dec-2021"*

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|---|---|---|---|
| SEMESTER | V | DATE OF EXAM | 10.12.2021 |
| SUBJECT NAME | Digital Electronics | SUBJECT CODE | PHH302B-T |
| BRANCH | Physics | SESSION | Evening (1-4pm) |
| TIME | 180 min | MAX. MARKS | 100 |
| PROGRAM | B.Sc | CREDITS | |
| NAME OF FACULTY | Dr. Shiv Kumar Dixit | NAME OF COURSE COORDINATOR | Dr. Shiv Kumar Dixit |

*Note: All questions are compulsory.* *Set B*

| Q.NO. | | QUESTIONS | MARKS | CO ADDRESSED | BLOOM'S LEVEL | PI |
|---|---|---|---|---|---|---|
| PART-A | Q.1(A) | Implement the EX-OR gate using NAND and NOR gate only. | 5 | CO1 | BT3 | 1.1.1 |
| | Q.1(B) | What is non inverting amplifier? Explain the concept of virtual ground in OP-AMP. | 5 | CO1 | BT2 | 1.2.1 |
| | Q.1(C) | What are de-multiplexers (DEMUX). Explain 1:4 De-multiplexers (DEMUX) with block diagram. | 5 | CO2 | BT3 | 1.2.1 |
| | Q.1(D) | Represent the function $F = \bar{A}\ C + (AB)(\bar{B} + C)$ using logic circuit diagram and simplify the following using Demorgan's theorem (i) $\overline{A + \overline{BC}}$ (ii) $\overline{AB + CD}$ | 5 | CO2 | BT1 | 1.1.1 |
| PART-B | Q.2 | Explain positive edge triggered clocked JK flip flop with truth table and logic circuit diagram. What is race around condition in JK flip flop? Explain how it occurs? Suggest a method to overcome the race around difficulty. | 20 | CO3 | BT4 | 1.1.1 |
| | Q.3 | (i) Explain SR flip-flop with truth table and logic circuit diagram. (ii) Define latch and write 5 differences between asynchronous and asynchronous sequential circuits. | 10+10 | CO3 | BT2 | 2.1.1 |
| PART-C | Q.4 | (a) What are counters? Explain ring counter with logic diagram and truth table. (b) Write five differences between synchronous and asynchronous counter and application of counters. | 10+10 | CO4 | BT3 | 2.1.1 |
| | Q.5 | (i) Explain microcomputer and its parts with block diagram. Also explain 8085 microprocessor architecture with its features. (ii) Implement a 4 bit serial IN serial OUT shift register using D flip flop and draw output wave form for an input 1010. | 15+5 | CO4 | BT3 | 2.1.1 |

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