Code No. OBS/201/P/21

M.Sc. II Semester Open Book Main Examination July 2021
Subject : - Physics
Paper-I : Quantum Mechanics- I

Max. Marks : 35
Min. Marks : 12

Note : Attempt all questions in about 250 to 300 words.
All questions carry equal marks.

Q.1   (a) Explain what is meant by expectation value of any dynamical variable in quantum mechanics. (2)
       (b) Show that $\frac{d}{dt}<p_x> = -<\frac{dv}{dx}>$ (5)

Q.2   (a) Describe in brief Bra and Ket notation for state vectors.
       (b) Obtain Heisenberg's uncertainty relation through Schwartz inequality.

Q.3   Solve Schrodinger equation for a linear harmonic oscillator, obtain the energy eigen values and draw the probability distribution functions for the first three quantum numbers.

Q.4   What are Pauli's spin matrices? Explain the matrix representation of angular momentum.

Q.5   (a) Derive the equation of continuity.
       (b) Explain the properties of a linear vector space.

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Code No. OBS/202/P/21

M.Sc. II Semester Open Book Main Examination July 2021
Subject : - Physics
Paper-II : Statistical Mechanics

Max. Marks : 35
Min. Marks : 12

Note : Attempt all questions in about 250 to 300 words.
All questions carry equal marks.

Q.1 How do you enumerate the states of a system? Establish the relation between the total number of microstates of a system (Ω) and the thermodynamic quantities of the system.

Q.2 What are identical particles? Obtain the expression for Bose Einstein statistics. Explain Bose Einstein condensation.

Q.3 Explain the method of cluster expansion for interacting particle system. Obtain the equation of state of such a gas.

Q.4 Discuss the approach to equilibrium of an ensemble of Brownian particles. Derive the Fokker-Planck equation. Give briefly one example of it's application.

Q.5 (i) Calculate the number of states and the density of states for a system confined to a box of volume V.
(ii) Explain the Ising model in the zeroth approximation.

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Code No. OBS/203/P/21

M.Sc. II Semester Open Book Main Examination July 2021
Subject : - Physics
Paper-III : Electrodynamics & Plasma Physics

Max. Marks : 35
Min. Marks : 12

Note : Attempt all questions in about 250 to 300 words.
All questions carry equal marks.

Q.1 Explain Laplace'd and Poisson's equations with physical significance. Apply them to solve problems.

Q.2 What are Lienard Wiechert potentials? How do you get them from retarded potentials?

Q.3 What do you mean by the structure of specetime? Discuss four vectors and Lorentz transformation in 4 dimensional spaces and invariance of electric charge.

Q.4 Drive equation for magneto hydrodynamic flow between boundaries with crossed electric and magnetic fields.

Q.5 Obtain solution for electromagnetic boundary value problem with Green function.

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Code No. OBS/204/P/21

M.Sc. II Semester Open Book Main Examination July 2021
Subject : - Physics
Paper-IV : Condensed Matter Physics

Max. Marks : 35
Min. Marks : 12

Note : Attempt all questions in about 250 to 300 words.
All questions carry equal marks.

Q.1 Explain obsorption of X-Rays. Discuss the rotating crystal method.

Q.2 Explain free electron Fermi gas. Explain the energy levels of orbitals in one and three dimensions.

Q.3 Define Hall Effect. Give the experimental setup for determination of Hall voltage and Hall resistance.

Q.4 Explain spin waves and magnons. Discuss Curie Weiss law for susceptibility.

Q.5 Discuss the following-
(i) Claussius- Mossotti- relation.
(ii) de Hass von alfen effect.

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Max. Marks : 10

Note : All questions are compulsory.

Q.1   Explain Truncation error and Round off error in Euler method.   (2)

Q.2   What is the purpose of the SCREEN, PSET, PRESET, LINE statement. How these statement can be applied in program.   (2)

Q.3   Write a program for simulation of Brownian motion of N=2 interacting particle by using "Monte Carlo" method.   (2)

Q.4   Develop a program for EM oscillations in a LC-circuit using Ruhge-Kutta Method.   (2)

Q.5   Solve the following problem by Runge-Kutta and Euler method.

$$\frac{dy}{dx} = \frac{5x^2 - y}{e^{x+y}}$$

Y(0) = 1
Given step size of h=0.1 for $0 \leq x \leq 1$ compare the result obtained using both methods and which method is more appropriate.   (2)

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Govt. M.H. College of Home Science & Science for women, Autonomous Jabalpur M.P.

Code No. OBS/202/P/21

M.Sc. II Semester Practical Sessional Examination July 2021
Subject : - Physics
Practical - II : Semi Electronics

Max. Marks : 10

Note : All questions are compulsory.

Q.1   Sketch the transfer characteristics for an N-channel depletion type MOSFET with IDSS = 10mA and Vp=4 volt.   (2)

Q.2   Design EX-OR gate using only NAND gates.   (2)

Q.3   What is $1^{st}/2^{nd}/3^{rd}/4^{th}$ generation processor?   (2)

Q.4   A_555 Timer is configured to run in as table mode with R_A=4KΩ, R_B=5kΩ and C= 0.01µf. Determine the frequency of the output & Duty cycle?   (2)

Q.5   Determine the positive pulse width, negative pulse width and free running frequency for an a stable multivibrator using 555 timer, R_A=4.7K, R_B=1k, C= 1µf, C_1= 0.01µf.   (2)

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