ATTAINMENT MEASUREMENT EXAMINATION – QUESTION PAPERS

M.Sc. PHYSICS – SEMESTER 1

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 1

PH010101: MATHEMATICAL METHODS IN PHYSICS 1

(10 MARKS EACH)

(Time – 2 Hrs.)

1. Obtain the expression for gradient, divergent and curl in spherical polar coordinate system.(CO1)
2. Discuss about covariant differentiation of tensors(CO3)
3. Explain Dirac matrices(CO3)
4. State and explain stokes theorem(CO1)
5. Discuss the properties of eigen values and eigen vectors of matrices(C02)
6. Explain the expression for the general geodesic equation(CO2)
7. Explain the process of orthonormalization(CO5)
8. Prove Cauchy-Schwarz inequality(CO5)
9. Derive Greens theorem(CO4)
10. Explain curl of a vector function and its physical significance(CO4)

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ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 1

PH010102: CLASSICAL MECHANICS

(10 MARKS EACH)

(Time – 2 Hrs.)

1. Obtain an expression for relative lagrangian of a particle(C04)
2. Derive Euler's equation for rigid body motion(CO3)
3. From the Hamiltonian principle obtain the Lagrangian(CO1)
4. What is meant by eigen values of the inertia tensor(CO3)
5. Discuss the normal modes and normal coordinates of free vibration of a CO2 molecule(C02)
6. State and prove Poissons theorem regarding Poissons bracket(CO2)
7. Explain Thomas precession(CO4)
8. What is meant by action angle variables(CO5)
9. What are cyclic coordinates(C05)
10. State Noether's theorem(CO1)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 1

PH010103: ELECTRODYNAMICS

(10 MARKS EACH)

(Time – 2 Hrs.)

1. Derive Jefimenkos equation(CO3)
2. Obtain an expression for Lienard-Wiechert potentials(CO3)
3. Explain the propagation of electromagnetic waves in a rectangular wave guide(CO4)
4. Explain why TEM waves cannot propagate in a hollow single conductor wave guide(CO4)
5. State Poyinting theorem(CO1)
6. Briefly explain the Maxwell's contribution to Amperes law(CO1)
7. Explain Abraham-Lorentz formula for radiation reaction(CO3)
8. What is meant by retarded potentials(CO3)
9. Explain reflection of electromagnetic waves at conducting surfaces(CO2)
10. Explain polarization in electromagnetic waves(CO2)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 1

PH010104: ELECTRONICS

(10 MARKS EACH)

1. Explain the working of triangular wave generator(C04)
2. Design and construct a first order low pass filter (CO2)
3. Explain the characteristics of a high pass filter frequency response (CO4)
4. Construct a square wave generator circuit with proper design procedure (CO2)
5. Explain the working of a voltage series feedback circuit (CO2)
6. Explain the working of a voltage follower (CO1)
7. Calculate the lower cut off frequency of a high pass filter with R=1K (CO3)
8. Construct a Band pass filter with center frequency 1 KHz (CO3)
9. Draw the schematic diagram of an RC oscillator (CO2)
10. Define slew rate with an example (CO1)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 1

PH010105: GENERAL PHYSICS PRACTICALS

(10 MARKS EACH)

TIME – 4 Hrs.

1. Construct the experimental setup for different experiments(CO1)
2. Connect the circuit and analyze the output (CO1)
3. Analyze the variation of output for different input ranges(CO2)
4. Draw a graph showing the output variations(CO2)
5. Calculate the final result (CO3)
6. Compare the result with theoretical values(CO3)

ATTAINMENT MEASUREMENT EXAMINATION – QUESTION PAPERS

M.Sc. PHYSICS – SEMESTER 2

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 2

PH010201: MATHEMATICAL METHODS IN PHYSICS II

(10 MARKS EACH)

TIME – 2 Hrs.

1. Derive Cauchy-Riemann equations in complex space (C01)
2. State and explain Fourier transform(CO1)
3. Explain Cauchy's integral formula with an example(CO2)
4. List out the properties of Laplace transform(CO2)
5. Obtain the relation between beta and gamma functions(CO2)
6. Compare the solutions of partial differential equation in Cartesian and polar coordinates(CO4)
7. Distinguish between Taylor and Laurent expansion(CO4)
8. Derive the solution of a damped harmonic oscillator(CO3)
9. Briefly explain the LCR circuit(CO3)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 2

PH010202: QUANTUM MECHANICS 1

(10 MARKS EACH)

TIME – 2 Hrs.

1. DESCRIBE INFERENCES FROM STERN GERLACH EXPERIMENT AND ITS SIGNIFICANCE IN DEVELOPMENT OF QUANTUM MECHANICS (CO1)
2. SHIOW THAT <X'/A/X"> IS THE MATRIX REPRESENTATION OF AN OPERATOR (CO1)
3. OBTAIN POSITION TIME UNCERTAINITY RELATIONSHIP IN DIRAC NOTATION (CO2)
4. DESCRIBE SCHRODINGER EQUATIION FOR TIME EVOLUTION OPERATOR (CO2).
5. OBTAIN 2X2 MATRIX REPRESENTATION OF ROTATION OPERATOR (CO3)
6. SHOW THAT ORBITAL ANGULAR MOMENTUM IS THE GENERATR OF ROTATION O0PERATRION (CO3)
7. OBTAIN SOLUTION FOR HYDROGEN ATOM WAVEFUNCTION (CO4)
8. COMPUTE CLEBSCH GORDON COEFFICIENTS (CO4).
9. NORMALIZE /a> = 2i/u> + /v>-5i/w>. calculate its norm.(CO5)
10. PROVE THE FOLLOWING(CO5)

    [Sx,Sy]=ihSz

    [xi,pj]=ih$ij

    [xi,xj]=0

    [pi,pj]=0

ATTAINMENT MEASUREMENT EXAMINATION

M.Sc. PHYSICS

2020-2022 BATCH

PH010203 – STATISTICAL MECHANICS

TIME: 2 Hrs

Maximum marks -100

1. Obtain the relation between the canonical partition function and Helmholtz free energy (CO1) (10 marks)
2. Discuss the energy fluctuation in canonical ensemble (CO1)(10 marks)
3. State and explain equipartition theorem. (CO1)(10 marks)
4. What is the difference between canonical and grand canonical ensemble (CO2)(10 marks)
5. Obtain the specific heat capacity for ideal gas in grand canonical ensemble.(CO2)(10 marks)
6. Discuss the nature of specific heat in solids.(CO2)(10 marks)
7. Obtain the density of states $g(\varepsilon)d\varepsilon$ for free particle confined in an area A, whose energy is lying between ε and $\varepsilon+d\varepsilon$.(CO3)(10 marks)
8. Using Sakur-Tetrode relation for entropy, obtain the thermodynamic relation for enery $E=3NKT/2$.(CO3)(10 marks)
9. Write a note on ideal Bose systems. (CO4)(10 marks)
10. For ideal Fermi gas for high but finite values of temperature, show that the equation of state takes the form of virial expansion. (CO4)
(10 marks)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc. PHYSICS – SEMESTER 2

PH010204 CONDENSED MATTER PHYSICS

TIME – 2 Hrs.

1. How do the different planes contribute to the formation of peaks in the XRD pattern? (CO1) -10 MARKS
2. Draw the crystal planes of (121) indices (CO1)(10).
3. Describe various crystal structure symmetry (CO2) (10)
4. Differentiate space group and point group .CO2). (10)
5. Compute the value of specific heat of solid by using Debye model (CO3) (10)
6. Obtain E-k curve from Kronig Penny model (CO3) (10)
7. Draw Temperature dependence of succeptibility of various solid (CO4) (10)
8. A two dimensional hexagonal lattice spacing a=3A^0, and one electron per unit cell. If electrons are considered free with in 2D plane, what is the Fermi energy $E_{F.}$(CO4). (10)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc. PHYSICS – SEMESTER 2

PH010205: ELECTRONICS PRACTICAL

(10 MARKS EACH)

1. Design and construct an integrator and a differentiator(CO1)
2. Construct an amplifier circuit and analyze its frequency response(CO1)
3. Design 5 types of filter circuit with a particular cut off frequency(CO2)
4. Draw the circuit diagram for an RC phase shift oscillator(CO2)
5. Draw the frequency response of filter circuits for various input frequencies(CO3)
6. Analyze the outputs of various oscillator circuits(C03)

ATTAINMENT MEASUREMENT EXAMINATION – QUESTION PAPERS

M.Sc. PHYSICS – SEMESTER 3

ATTAINMENT MEASUREMENT EXAMINATION

M.Sc. PHYSICS

2020-2022 BATCH

PH010301: QUANTUM MECHANICS II

TIME – 2 Hrs.

10 marks each

1. Compare Schrodinger and Heisenberg pictures(CO1)
2. Does Schrodinger's equation have the same form for all inertial observers .Give reasons (CO1)
3. What is scattering amplitude(CO2)
4. Explain the time dependent perturbation theory(CO2)
5. Write a note on identical particles(CO3)
6. Explain the validity of born approximation(CO3)
7. Explain Klein-Gordon equation(CO4)
8. Discuss the non-relativistic limit of the Dirac equation(CO4)

ATTAINMENT MEASUREMENT EXAMINATION

M.Sc. PHYSICS

2020-2022 BATCH

SEMESTER 3

PH010302 COMPUTATIONAL PHYSICS

TIME – 2 Hrs.

1. Solve the following system by Gauss Jordan method. (CO1)(10 Marks)
   2x+y+z=10
   3x+2y+3z=18
   X+y+9z=16
2. Evaluate ∫ (dx/1+x2) in the limit 0 to 6 using trapezoidal rule. (CO1)(10 Marks)
3. Briefly explain the algorithm for Simpson's 3/8 rule. (CO2)(10 Marks)
4. Briefly explain the algorithm for trapezoidal rule. (CO2)(10 Marks)
5. Discuss the RK method and derive the fourth order formula. (CO2)(10 Marks)
6. Obtain newton backward difference with table. (CO3)(10 Marks)
7. Discuss the fitting by exponentials. Bring out the non linear fitting in detail. (CO3)(10 Marks)
8. Explain the procedure for fitting a straight line. (CO3)(10 Marks)
9. Write C++ program for Simpson's 1/3 rule. (CO4)(10 Marks)
10. Write C++ program for trapezoidal rule. (CO4)(10 Marks)

ATTAINMENT MEASUREMENT EXAMINATION

M.Sc. PHYSICS

2020-2022 BATCH

SEMESTER 3

PH010303 ATOMIC AND MOLECULAR PHYSICS

TIME- 2 Hrs.

10 marks each

1. Describe the quantum theory of hydrogen atom and hydrogen spectra. (CO1)
2. Explain the emergence of stokes and Anti-stokes lines in Raman spectroscopy. (CO1)
3. Draw and explain the allowed transitions in sodium D1, D2 lines when the sample is placed in magnetic field. (CO2)
4. Discuss the term symbols arising from two equivalent s electrons. Why are some term symbols omitted? (CO2)
5. Distinguish SARS and CARS spectroscopy? (CO3)
6. Distinguish between NMR and ESR spectroscopy? (CO3)
7. Obtain expression for spin-orbit interaction energy for combination of s and p electrons in valance shell? (CO4)
8. Show that 1F3-1D2 transition will give a normal Zeeman triplet? (CO4)

ATTAINMENT MEASUREMENT EXAMINATION

M.Sc. PHYSICS

2020-2022 BATCH

SEMESTER 3

PH810301: SOLID STATE PHYSICS FOR MATERIALS

TIME – 2 Hrs.

10 marks each

1 Differentiate between Frenkel and Schottky defects(CO1)
2 What is meant by Kramer's Kronig relations (CO1)
3 What is the difference between ionic and covalent crystals (CO2)
4 Describe the formation of plasma oscillations (CO3)
5 Write any two properties of electron-phonon interactions (CO3)
6 Explain the term microstructural changes during cooling(CO4)
7 Write a note on binary phase diagrams (CO2)
8 Discuss the effect of exactions in energy band gap (CO4)

ATTAINMENT MEASUREMENT EXAMINATION

M.Sc. PHYSICS

2020-2022 BATCH

PH810302: ADVANCED PRACTICALS IN MATERIAL SCIENCE

TIME – 4 Hrs.

10 marks each

1. Find out the crystal structure and grain size of the given sample using XRAY DIFFRACTION data provided. (CO1)
2. Find the lattice strain of the given material using XRAY DIFFRACTION data provided. (CO1)
3. Calibrate silicon diode as a temperature sensor. (CO2)
4. Find out temperature coefficient of resistance and band gap for the given thermistor. (CO2)
5. Find the wavelength of given laser using young's double slit method. (CO3)
6. Calibrate a thermocouple as a temperature sensor. (CO3)

ATTAINMENT MEASUREMENT EXAMINATION – QUESTION PAPERS

M.Sc. PHYSICS – SEMESTER 4

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc. PHYSICS – SEMESTER 4

PH010401: NUCLEAR AND PARTICLE PHYSICS

(10 MARKS EACH)

TIME – 2 Hrs.

1. What are the characteristics of fusion (CO1)
2. Compare shell model and liquid drop model (CO2)
3. What is binding energy per nucleon? Explain (CO1)
4. Describe the working and construction of a fission reactor (CO2)
5. What is the significance of magic numbers (CO2)
6. Differentiate between hadrons and leptons (CO3)
7. Briefly discuss on parity (CO3)
8. What is meant by CPT theorem (CO3)
9. Write a note on Higgs boson (CO4)
10. Discuss the terms CAT and PET (CO4)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc PHYSICS – SEMESTER 4

PH810402: SCIENCE OF ADVANCED MATERIALS

(10 MARKS EACH)

Time – 2 Hrs.

1. Discuss glass ceramics (CO1)
2. Explain the purpose of thermal treatment of glass (CO1)
3. Write a note on dielectric breakdown (CO1)
4. Explain the working principle of LED (CO2)
5. Briefly explain the process of sputtering (CO3)
6. Discuss any 2 crystal growth processes (CO3)
7. Write a note on crystallization of polymers (CO1)
8. Explain the working of hetero junction laser (CO2)
9. What is the importance of line shape wave function (CO4)
10. Discuss about photonic and liquid crystals (CO4)

ATTAINMENT MEASUREMENT EXAMINATION

(2020-2022 BATCH)

M.Sc. PHYSICS – SEMESTER 4

PH810403:NANOSTRUCURES AND MATERIALS CHARACTERISATION

(10 MARKS EACH)

Time – 2 Hrs.

1. Explain quantum confinement in one dimension (CO1)
2. Explain photoacoustic effect (CO2)
3. Explain spectrophotometric accuracy (CO3)
4. How can SEM provide enlarged view of samples? (CO3)
5. Explain the properties of different nanostructures? (C01)
6. What is the principle of FTIR spectrometer (C02)
7. Explain the principle of lithography (CO4)
8. Explain the characteristics of quenching process (C04)
9. What are the applications of ferrofluids (CO5)
10. What are the applications of mass spectrometer (CO5)

ATTAINMENT MEASUREMENT EXAMINATION

2020-2022 BATCH

M.Sc. PHYSICS

SEMEMESTER 4

PH010402 COMPUTATIONAL PHYSICS PRACTICALS

1. Find solution to a non-linear algebraic equation using Bisection method. (CO1)
2. Calculate ∫f(x)dx using monte carlo integration. (CO1)
3. Write and execute a program to generate standing wave patterns? (CO2)
4. Write and execute a program to generate interference pattern. Change the distance of the screen from the slit and check whether the intensity varies with distance? (CO2)
5. Write and execute a C++ programme to study graphically the variation of magnetic field Hc(T) with temperature in a superconductor using the relationship
   Hc(T)=Hc(0)[1-(T/Tc)2]
   (CO3)
6. Write and execute a program to demonstrate the motion of a projectile. (CO3)

ATTAINMENT MEASUREMENT EXAMINATION

2020-2022 BATCH

M.Sc. PHYSICS

SEMEMESTER 4

PH010403 – PROJECT

PRESENTATION AND ORAL EXAMINATION

1. Explain experimental procedures that you have adopted for this project? (CO1)
2. Why did you select this topic? (CO1)
3. Briefly explain characterization techniques used in this project? (CO2)
4. What is the significance to experimental outputs that you have obtained? (CO2)
5. What have you learned from this project? (CO3)
6. What is the future scope of your project? (CO3)

ATTAINMENT MEASUREMENT EXAMINATION

2020-2022 BATCH

M.Sc. PHYSICS

SEMEMESTER 4

PH010404 – COMPREHENSIVE VIVA VOCE

1. Explain Maxwell's equations. What is its physical significance? (CO1)
2. Distinguish between Lagrangian and Hamiltonian formalism? (CO1)
3. What are the basic features of filter circuits? (CO2)
4. Distinguish Schrodinger picture and Heisenberg picture. (CO2)
5. Explain emergence of stokes and anti-stokes lines? (CO3)
6. Explain grand unified theory? (CO3)