M 26585

Reg. No. : .....

Name : .....

I Semester M.A./M.Sc./M.Com. Degree (Reg./Supple./Improve.) Examination, November 2014

PHYSICS

(2014 Admn. Under CBSS)

PHY 1C 01 : Mathematical Physics – 1

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **both** questions, **either** (**a**) or (**b**).

1. a) With suitable example explain in detail Unitary and Orthogonal Matrices. If a square matrix A of order n has n linearly independent Eigen vectors, then a matrix P can be found such that P^{-1} AP is a diagonal matrix.

OR

b) Obtain an expression for Grad, Divergence and Curl in terms of Circular Cylindrical Coordinates.

2. a) Prove that Hermitian matrix remain Hermitian under unitary similarity transformation. If A and B are two square matrices and A is non-zero singular prove that $A^{-1}B$ and BA^{-1} have the same Eigen value.

OR

b) Discuss the general solution of Bessel differential equation. Explain briefly the orthogonal property of Bessel function. **(2×12=24)**

P.T.O.

SECTION – B

Answer **any four** :

3. a) Give the advantages of curvilinear coordinate system.

   b) Obtain an expression for curl in spherical coordinate system.

   c) Briefly explain unit vectors in spherical coordinates.

4. a) Explain what is rank of a tensor.

   b) Show that every tensor of second rank can be resolved into symmetric and anti-symmetric Parts.

   c) With suitable example explain contraction. State and prove quotient law.

5. a) Explain order and degree of a differential equation.

   b) Solve the equation $\frac{d^2y}{dx^2} + \cot x\left(\frac{dy}{dx}\right) + 4\left(\operatorname{cosec}^2 x\right)y = 0$.

   c) Discuss in detail the series integration method of the solution of Linear Differential Equations (Fresenius method).

6. a) Discuss Cauchy Integral formula.

   b) State and explain Laurent's theorem.

   c) Evaluate the following integral using residue theorem :

   $\int_c \frac{4-3z}{z(z-1)(z-2)}\,dz$ Where c is the circle $|z| = \frac{3}{2}$.

7. a) Define Beta function.

   b) Define Gamma function. Derive the recurrence relation $\tau(n) = \frac{1}{n}\tau(n+1)$.

   c) Write down Bessel's differential equation and discuss in detail its solution.

8. a) What is Legendre Polynomial ?

   b) Show that $P_n(1) = 1$.

   c) Prove that $P_n(\cos\theta)$ can be expressed as a series consisting of cosines of even or odd integer multiples of θ.

(4×9=36)

M 26586

Reg. No. : .....

Name : .....

I Semester M.A./M.Sc./M.Com. Degree (Reg./Supple./Improve.) Examination, November 2014

PHYSICS

(2014 Admn. Under CBSS)

PHY 1C 02 : Classical Mechanics

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **both** questions, **either** (**a**) or (**b**).

1. a) What is Rutherford scattering ? Derive Rutherford scattering formula. Obtain the angular distribution of the decay products in the L-system.

OR

b) Define clearly the term 'action'. State Hamilton's principle and derive Lagrange's equations of motion.

2. a) Define the Hamiltonian of a system of particles and obtain the canonical equations of motion. Discuss the physical significance of the Hamiltonian.

OR

b) Define Euler angles and show that these can be seen as three successive rotations which take us from the fixed system to the moving axes system.

(2×12=24)

SECTION – B

Answer **any four**.

3. a) What is the principle of least action ?

b) Write down the Euler -Lagrangian equation and discuss its importance in classical mechanics.

c) Compare and contrast Lagrangian formalism and Hamiltonian formalism. Explain with suitable example why Hamiltonian formalism is more basic to the foundations of statistical and quantum mechanics.

P.T.O.

4. a) What is Poisson Brackets ?
   b) State the properties of Poisson Brackets.
   c) Discuss the harmonic oscillator problem using Hamiltonian Jacobi method.

5. a) What is Kepler's laws of planetary motion ?
   b) Discuss the conditions for a transformation to be canonical.
   c) Derive Hamilton Jacobi equation for Hamilton's function.

6. a) Briefly explain moment of inertia tensor.
   b) Prove that the dimension of the action variables are always those of angular momentum.
   c) Derive the frequency in Kepler problem by using the method of action-angle variable.

7. a) What is small oscillation ? Give any one example.
   b) Write down the Lagrange's equations of motion for small oscillation.
   c) Discuss the general problem of small oscillations in one degree of freedom.

8. a) What is Corioli's force ?
   b) What are direction cosines ? What is an orthogonal transformation ?
   c) Derive Corioli's force in Lagrangian formulation. (4×9=36)

M 26587

Reg. No. : .....

Name : .....

I Semester M.A./M.Sc./M.Com. Degree
(Regular/Supplementary/Improvement) Examination, November 2014
PHYSICS
(2014 Admn. Under CBSS)
PHY 1C 03 – Electrodynamics

Time : 3 Hours Max. Marks : 60

SECTION – A

(Answer **both** questions, either (a) or (b)).

1. a) Discuss Poisson's equation and Laplace's equation. Derive the expression of Laplace's equation in spherical coordinate system.

OR

b) Derive Maxwell's equations in matter. Describe the boundary conditions for B and H.

2. a) Derive Abraham-Lorentz formula for the radiation reaction force and give its significance.

OR

b) Explain in detail the theory of field tensor. Prove that the symmetry of a tensor is preserved by Lorentz transformation. **(2×12=24)**

SECTION – B

(Answer **any four**).

3. a) Explain the method of images.
   b) Show that electric field is the gradient of a scalar potential.
   c) Obtain the values of divergence and curl of electric field.

4. a) Define mean value and maximum value theorem.
   b) Calculate the potential function for the region between the parallel circular disc.
   c) A point charge +q is placed in front of an infinite conducting plane connected to earth. Derive an expression for the electric field at a point on the plane and the surface density of charge at any point on the plane by the method of images.

P.T.O.

5. a) Define Biot-Savart Law.
   b) State and prove Amperes theorem.
   c) Derive an expression for Poynting vector, give its significance.

6. a) What is skin depth ?
   b) Obtain the boundary condition for reflection and transmission.
   c) What are monochromatic plane wave ? Show that E and B are in phase and mutually perpendicular.

7. a) What is Gauge transformation ?
   b) What do you meant by retarded potential ? A piece of wire bent into a loop, carries a current which varies with time. Calculate the retarded potential.
   c) Discuss the theory of radiation from an arbitrary distribution of charge and currents.

8. a) What is Lienard-Wiechert potentials for a moving point charge.
   b) Justify that magnetism as a relativistic phenomenon.
   c) Explain with necessary theory how the fields transform. What is transformation law for the electromagnetic field. (4x9=36)

M 26588

Reg. No. : .....

Name : .....

I Semester M.A./M.Sc./M.Com. Degree (Reg./Supple./Improve.) Examination, November 2014

PHYSICS

(2014 Admn. Under CBSS)

PHY 1C 04 : Electronics

Time : 3 Hours

Max. Marks : 60

SECTION – A

(Answer **both** questions, either **(a)** or **(b)**).

1. a) What are the four differential amplifier configurations ? Which one is not commonly used and explain why ?

OR

b) Draw the basic circuit diagram of a square wave generator using Op. Amp. Comparator and integrator. Describe it's working.

2. a) Draw the circuit of a monostable multivibrator as pulse generator and describe it's working.

OR

b) List the registers in the 8085 microprocessor and explain their function.

(2×12=24)

SECTION – B

(Answer **any four**).

3. a) What is meant by the term operational amplifier ?

b) List the main characteristics of an Op. Amp.

c) Draw the transistor characteristic of a Diff. Amp.

P.T.O.

4. a) How does the transconductance vary with differential voltage ?

   b) Draw the schematic diagram of ideal inverting Op.Amp. and explain.

   c) Draw the schematic diagram of an ideal non-inverting Op.Amp. with voltage series feedback. Derive the expression for the voltage gain.

5. a) Describe the principle of pole-zero compensation method.

   b) Describe the method of measuring slew rate.

   c) Describe an experimental method for determination of poles of an Op.Amp.

6. a) What are the main differences between synchronous and asynchronous logic circuit ?

   b) With a circuit diagram explain flip flop operating characteristics.

   c) Explain the principle and working of a crystal controlled cock generator.

7. a) What is a register ?

   b) Explain the function of a four stage ring counter.

   c) Explain the function of a master-slave JK flip-flop. Explain how it eliminate the race-around condition.

8. a) Show the memory hierarchy.

   b) Explain why is primary memory faster than the secondary memory.

   c) Explain in detail how the main memory of a computer is organized ? How memory cells are arranged to create different types of memories. (4×9=36)
