**Imayam Arts And Science College -kannanur**

**Department of Physics**

**Subject Incharge:P.Thamilarasi** **Subject code:16RCCSPH9**

**Subject name :Theoretical physics**

## Unit-1-Fundmental of principles and lagrangain formulation

**2 mark questions**:

**1)Define conservation principles.**

The word conservation applies in the sense of constantness when

Some characteristic of the motion of a system remains constant in time. In

Our physical world there exists number of conservation principles or laws.

**2)What are degrees of freedoms.**

We then conclude that imposing constraints is a way of simplifying the problem mathematically in that the number of equations of motion are reduced to the same number as the number of degrees of freedoms.

**3)What are the classification of constraints.**

i) Scleronomic

ii) Holonomic

iii) Bilateral

iv) Conservative

v) Dissipative

**4)Define constraints.**

There is one significant point to note constraints not constraints not only interfere with the solution of the problem in that the coordinates are no longer independent but they are always associated with the force by virtue of which they motion of the system force of constraints.

**5)What are the principles in generalised co-ordinates.**

i) their values determine the configuration of the system

ii)they may be varied arbitrarily and independently of each other without violating the constraints on the system

iii)there is no uniqueness in the choice of generalised coordinates then our choice should fall on a set of coordinates that will give us a reasonable mathematical simplification of the problem.

**6)Define principles of virtual work.**

This method is based on the principles of virtual work. The system is subjected to an Infinitesimal displacement consistent with the forces and constraints imposed on the System at the given instant t .this change in the configuration of the system is not associated with a change in time.

**7) Define D'Alebert's principles.**

$\sum_i (F_i - P_i)\, \partial r_i = 0$

this is called D'Alebert's principles.

**5 mark questions**:

1)Explain the conservation of linear momentum and angular momentum

2) Explain the conservation of energy.

3)Drive the mechanics of a system of particles

.4) Explain Atwood's machine.

5) Explain simple pendulum.

**10 mark questions**:

1)State Hamilton's variation principle.

2) Explain Lagrange's equation from D'Alebert's principles.

3)Explain the principle of virtual work and D'Alebert's principles.

4) Explain Lagrange's equation of motion

5)Deduction of Hamilton's principle from D'Alebert's principle.

## Unit-ii –Hamilton's formulation

**2 mark questions**:

**1)Define phase space.**

The Phase space of 6N dimensions coordinates.3N dimensions position .

Coordinates. 3N dimensions momentu coordinates.

**2)Define conservation theorem.**

A conservation law states that a particular measurable property of an isolated

Physical system does not change as the system evolves over time.

**3)Define cyclic co-ordinates.**

We have that Lagrangian L is a function of generalised co-ordinates $q_j$ ,generalised

Velocity $\dot{q}_j$ and time t .now if the Lagrangian of a system does not contain a particular

Coordinates $q_k$ a system Lagrangian function is zero.

**4)Define symmetry properties.**

If any system or any function representing a property of the system does not change

Under some operation carried on the system the system is said to possess a symmetry

with respect to that operation.

**5)What is Hamilton principle.**

Hamilton principle states that the development in time for a mechanical system is such

that the integral of the difference between the kinetic and the potential energy is

stationary.

**6) What is Variational principle.**

The variational principle is a scientific principle used within the calculus of

variations, which develops general methods for finding functions which extremize

the value of quantities that depend upon those functions.

**5 mark questions**:

1)Drive Hamilton's canonical equation of motion.

2)Deduction of Hamilton's equation from variation principle.

3)Explain principle of least action.

4) Explain Generalized momentum.

5)State conservation theorem for energy

6)Explain conservation theorem for Generalized momentum

**10 mark questions**:

1)Drive Hamilton's canonical equation of motion.

2)Deduction of Hamilton's equation from variation principle.

3)Explain principle of least action.

## Unit-iii -Dual nature of matter

**2 mark questions:**

**1) Define De Broglie wavelength**

The wave associated with the matter particles are called matter waves or De –Broglie waves.

**2) Define group velocity.**

The group velocity of a wave is the velocity with which the overall envelope shape of the waves amplitudes –known as the modulation or envelope of the wave.

**3) Define wave velocity.**

The velocity with which planes of equal phase through the medium.

**4) What is Heisenberg's uncertainty principle.**

Heisenberg's uncertainty principle is applied such that the better you known that Position of a particle the less you known about its momentum.

**5) What is principles electron microscope.**

Like an optical microscope,its purpose is to magnify extremely minute object. the resolving power of microscope is inversely proportional to the wavelength of the radiation used for illuminating the object under study.

**6) What is electron microscope.**

It is a microscope which uses electron beam to illuminate a specimen and it produces an enlarged image of the specimen.

**5 mark questions:**

1) Drive De Broglie wavelength.

2) State group velocity for De Broglie wavelength.

3) State wave velocity for De Broglie wavelength.

4) Describe electron microscope.

5) Describe gamma ray microscope.

**10 mark questions:**

1) Describe principles and working for Division and Germer experiment.(or)

2) Describe principles and working for experimental study of matter waves.

3) Describe G.P Thomson's experiment for verifying De Broglie relation.

4) Describe Heisenberg's uncertainty principle.

## Unit – iv –Basic of quantum mechanics

**2 mark questions:**

**1)Define wave mechanics?**

The mathematical description of atomic and subatomic particles in term of their wave characteristics.

**2)Any two basic postulates of wave mechanics?**

i) Associated with any particle moving in a conservative field of force is a wave function which determines everything that can be known about the system.

ii) the set of eignfunctions of operator Q will form a complete set of linearly independent function.

**3) Any two properties of wave function.**

i) All measurable information about the particle is available.

ii ) using the Schrödinger equation energy calculations becomes easy.

**5 mark questions:**

1)Expression for time dependent wave equation.

2)Derive orthogonal normalized wave function.

3) Any five properties of wave function.

4) Basic postulates of wave mechanics?

**10 mark questions:**

1)Expression for time independent wave equation.

2) Derive normalized wave function of Eigen function and Eigen values.

3)Describe Ehrenfest's theorems.

## Unit- v –Exactly solvable quantum systems

**2 mark questions:**

**1)Define barrier potential.**

The rectangular potential barrier is a standard one dimensional problem that demonstrates the phenomena of wave mechanical tunnelling and wave mechanical reflection.

**2) Define reflectance.**

The property of a particular sample of that material or a particular surface.

3) Define transmittance.

Transmittance of the surface of a material is its effectiveness in transmitting radiant energy.

**5 mark questions:**

1)Explain linear harmonic oscillator.

2) Explain hydrogen atom.

**10 mark questions:**

1)Derive particle in a box.

2) Derive rectangular barrier potential.

3)Describe rigid rotator.