

B.Sc. Semester - 5 (Remedial) (CBCS) Examination

February/March. -2020

**MATHEMATICAL PHYSICS CLASSICAL MECHANICS AND QUANTUM MECHANIC
(CORE)**

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que:1(a) Answer the following (Any one out of two)**07 marks**

- (1) Explain fourier sine and cosine transforms

OR

- (2) Obtain fourier series for square wave rectifier.

(b) attempt any one**04 marks**

- (1) Write advantages of fourier series or
- (2) Explain 3-D Dirac Delta function.

(c) Attempt any three (out of five)**03 marks**

- (1) Cosine series is applicable for odd function (true or false)
- (2) Write the bn value for an odd function(sine series).
- (3) Write a fourier coefficient $a_n = \dots\dots\dots$
- (4) In which interval the function $x/1-x$ does not satisfy the Dirichlets condition?
- (5) Write one property of Dirac-Delta function.

Que:2(a) Answer the following (Any one out of two)**07 marks**

- (1) Explain constraints motion ;constraints& degree of freedom.
- (2) Obtain Langrange's eqn. from D'Alemberts principle.

(b) attempt any one**04 marks**

- (1) What is Rayleigh's Dissipation function or
- (2) Apply Langrangian eqn. for Atwood Machine.

(c) Attempt any three (out of five)**03 marks**

- (1) what is constraint?
- (2) A constraints which does not depend on time is called
- (3) In Langrangian approach we considerquantities(write appropriate word).
- (4) Write statement for Hamiltonian variational principle.
- (5) Write application of Langrangian Eqn. of motion.

Que:3 (a) Answer the following (Any one out of two)**07 marks**

- (1) Make detailed analysis of Non-holonomic system of Langrangian method of undetermined multipliers .

OR

- (2) Application of Langrange's eqn. of motion -Linear Harmonic oscillator.

(b) attempt any one**04 marks**

- (1) What is phase space? Explain it.
- (2) Write application of Hamiltonian principle for simple pendulum.

(c) Attempt any three (out of five)**03 marks**

- (1) Configuration space isdimensional space.
- (2) Langrange's undetermined multiplier is denoted by.....
- (3) Write eqn for compound pendulum for Hamiltonian eqn.
- (4) Write advantage of Hamiltonian approach.
- (5) Explain in short : charged particle in electromagnetic field.

Que:4 (a) Answer the following (Any one out of two)

07 marks

- (1) Derive schrodinger's eqn for free particle in one dimensional motion and generalize it to 3-Dimensional.

OR

- (2) Write about physical interpretation of $\langle \psi | \hat{O} | \psi \rangle$ expectation value.

(b) attempt any one

04 marks

- (1) Derive eqn for particle in one-dimensional potential well of finite depth. or
- (2) Group velocity of wave packet.

(c) Attempt any three (out of five)

03 marks

- (1) Explain wave nature of matter.
- (2) Write about Compton effect (briefly).
- (3) What is Eigen function?
- (4) Write compact expression for quantum mechanical H-operator for the particle
- (5) The N^2 is called of the wave function ψ .

Que:5 (a) Answer the following (Any one out of two)

07 marks

- (1) Write a solution for time dependent schrodinger eqn in detail, with operator representation.

OR

- (2) Explain Harmonic oscillator wave function, with necessary eqn.

(b) attempt any one

04 marks

- (1) What is coherent state?
- (2) Explain two body problem

(c) Attempt any three (out of five)

03 marks

- (1) write eqn for spherically symmetric potential
- (2) write completeness condition for wave function.
- (3) What is orthogonal condition ?
- (4) What is orthonormality condition ?
- (5) what is density operator ?; define it.
