PAP-003-001501 Seat No. _____

B. Sc. (Sem. V) (CBCS) Examination

October / November - 2018

Physics - 501

(Mathematical Phy., Classical Mech. & Quantum Mech.)
(Old)

Faculty Code : 003
Subject Code : 001501

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All Questions are compulsory.
(2) Symbols have their usual meaning.
(3) Figure on right sides indicates full marks.
(4) Student can use non-programmable calculator.

1 Answer following shorts question each carry one mark : **20**

(1) A system of N particles having K equations of contains has _____ degrees of freedom.

(2) Define constrain.

(3) Generalized co-ordinate q_j has dimension of length (true / false)

(4) Write the mathematical form of the De'Alember's principle.

(5) Configuration space is a _____ dimensional space.

(6) Lagrange's undetermined multiplier is denoted by _____

(7) Write the time independent Schrodinger equation.

(8) Write the Dirichlet conditions.

(9) The N^2 is called the _____ of the wave function Ψ.

(10) Write Ryaleigh's dissipation function.

(11) Define the Lagrange's of any particle.

(12) In Lagrangian approach we consider Scaler quantites (True/False)

(13) Define constrain motion.

(14) Define the Hamiltonian.

(15) $\left[P, x^n\right] =$ _____

(16) What is quantum mechanical operator of angular momentum L_x ?

(17) The eigen values of a self adjoint operator is Complex. (True / False)

(18) Define phase space.

(19) A constrain which does depend on time is Called _____

(20) Define Dirac delta function.

2 (a) Answer any three question each carry two mark : **6**

(1) Explain the principle of virtual.

(2) Write expression for generalized momentum and explain in short.

(3) Explain cyclic coordinates.

(4) Write the fourier series.

(5) Describe the particle in a square well potential.

(6) Write and explain Schrodinger equation of a free particle.

(b) Answer any **three** question each carry three mark : **9**

(1) Apply Lagrange's equation to solve the problem of a bead sliding on a uniformly rotating.

(2) Obtain Newton's equation of motion from Lagrange's equation.

(3) Give the interpretation of probability.

(4) Explain : Self adroitness with illustration.

(5) Explain operator Correspondence.

(6) Give physical interpretation of Ψ.

(c) Answer any **two** question each carry five mark : **10**

(1) Obtain a generalized expression of kinetic energy.

(2) Derive Lagrange's equation of motion considering $\Sigma_i F_i . \delta r_i = \Sigma_i Q_i \delta_{qj}$.

(3) Give the application of fourier series in the problem of full-wave rectification.

(4) What is box normalization ? Explain.

(5) Write a note on energy eigen values of discrete spectrum.

3 (a) Answer any **three** question each carry two mark : **6**

(1) What is phase space ?

(2) State Hamilton's principle.

(3) Explain the degrees of freedom.

(4) Explain the Holonomic and Non-holonomic constrains.

(5) Briefly explain the fundamental postulates of wave mechanics.

(6) Explain In brief the stationary states.

(b) Answer any **three** question each carry three mark : **9**

(1) Describe fourier sine and cosine series.

(2) Explain D'Alembert's principles.

(3) Discuss phase space.

(4) Write Ehrenfest's theorem.

(5) Obtain fourier coefficient a_0 for a function $f(x) = x \sin x$ in the interval $-\pi < x < \pi$.

(6) Derive equation for motion of simple pendulum using Langrange's equation.

(c) Answer any two question each carry five mark : **10**

(1) Derive time independent Schrodinger equation.

(2) Explain in detail the Lagrange's undetermined multipliers.

(3) Derive co-efficients of Fourier Series.

(4) Derive Lagrange's equation.

(5) Explain Eigen value problem degeneracy.
