647510 **BSc5PhyC501x** **Seat No :________**

B.Sc. Semester - 5 (Remedial) (*CBCS*) Examination
March/April-2023 (NEW COURSE)
Mathematical Physics, Classical Mechanics & quantum Mechanics(Core)

Time: 2:30 Hours **Marks: 70**

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

Q.1(a) Answer the following questions (any two) (10)
1) Write a short note on Gradient.
2) Discuss the stock's integral for integral calculus.
3) Give the relations between fundamental theorem.

Q.1(b) Answer the following questions (any one) (04)
1) Write the fundamental theorem for Gauss's with geometrical interpretation.
2) Write six product rule for differential calculus.

Q.2(a) Answer the following questions (any two) (10)
1) Evaluate its co-efficient of Fourier series.
2) Obtain Fourier series for square waves.
3) Obtain Sine series.

2(b) Answer the following questions (any one) (04)
1) Obtain cosine series.
2) Obtain Fourier series for a full wave rectifier function.

Q.3(a) Answer the following questions (any two) (10)
1) Explain the generalized coordinates.
2) Deduce Lagrange's equations from D'Alembert's principle.
3) Obtain the Lagrange's equation of motion.

Q.3(b) Answer the following questions (any one) (04)
1) Explain constraints.
2) Obtain Hamilton's equation of motion for simple pendulum.

Q.4(a) Answer the following questions (any two) (10)
1) Obtain the Schrodinger's equation for free particle in one dimension.
2) Explain Box normalization.
3) Prove probability of any quantum system is conserved.

Q.4(b) Answer the following questions (any one) (04)
1) Describe admissibility conditions on the wave function.
2) Derive time independent Schrodinger's equation.

Q.5(a) Answer the following questions (any two) (10)
1) Show that eigen values of self-adjoint operator are real.
2) Show that expectation value and eigen value of self-adjoint are real.
3) Explain one of the fundamental postulates of wave mechanics.

Q.5(b) Answer the following questions (any one) (04)
1) Prove that: $[L_y, L_z] = i\hbar L_x$.
2) Prove that: 1. $(A+B)^{\dagger} = A^{\dagger} + B^{\dagger}$

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