SHRI RAMSWAROOP MEMORIAL UNIVERSITY
End Semester Examination (2021-22)-Odd Semester

M.Sc. (Physics)- I Year (I Sem)

Course Name: Classical Mechanics	Code: MPH1001
Time: 02 Hours	Max Marks: 60

University Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

(To be filled by the Student)

Note: Please read instructions carefully:

  a) *The question paper has 03 sections and it is compulsory to attempt all sections.*

  b) *All questions of Section A are compulsory; questions in Section B and C contain choice.*

Section A: Very Short Answer type Questions Attempt all the questions.	BL	CLO	Marks (10)
1. What are the limitations of Newton's law of motion that was formulated for the dynamical objects?	BL2	CLO1	02
2. Summarize the basic idea of Hamilton's variation principle. Under what condition it is called the law of least condition?	BL2	CLO1	02
3. Explain the three laws of planetary motion as suggested by Kepler.	BL1	CLO2	02
4. How the dissipative force influences the nature of forced vibrations?	BL1	CLO3	02
5. Write the equation of motion in Poisson bracket form. Under what condition this Poisson bracket vanishes.	BL2	CLO4	02
Section B: Short Answer Type Questions Attempt any 03 out of 05 questions.	BL	CLO	Marks (30)
1. Examine the equation of motion for Atwood machines by using Lagrangian equation of motion. What happened if both masses of machine become equal?	BL3	CLO1	10
2. Discuss the meaning of the ignorable/ cyclic coordinates. Prove that the conjugate momentum of cyclic coordinate is always conserved.	BL3	CLO1	10
3. Derive the Lagrangian function for a body moving under central force in terms of polar coordinates r and θ.	BL4	CLO2	10
4. Examine the properties of Legendre transformation. Find the general expression for Hamiltonian of a system by using the Legendre transformation rules.	BL2	CLO3	10
5. By considering the general theory of oscillations obtains the expression for the secular equation for two coupled oscillators.	BL4	CLO4	10
Section C: Long Answer Type Questions Attempt any 01 out of 03 questions.	BL	CLO	Marks (20)
1. Derive the Lagrange equation of motion by using Hamilton's principle. Discuss why Hamilton's principle is considered as more profound than the Newton's law of mechanics.	BL4	CLO1	20
2. Prove that for the central force field the effective force is the sum of the central force and centrifugal force. Derive the expression for effective potential and discuss the motion for the attractive force	BL3	CLO2	20

	condition.			
3.	Discuss in detail the Lagrange's equation of motion for the small oscillation condition. Apply this theory to evaluate the frequency modes of the tri-atomic molecule.	BL4	CLO3	20