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MPHY-502

Classical Mechanics and Numerical Mathods

M.Sc. Physics (MSCPHY-20)

Ist Semester, Examination, June 2022

Time : 2 Hours Max. Marks : 40

Note : This paper is of Forty (40) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION – A

(Long-answer – type questions)

Note : Section 'A' contains Five (05) long-answer-type questions of Ten (10) marks each. Learners are required to answer any Two (02) questions only. (2×10=20)

1. (a) Derive Lagrange's equations from Hamiltion's Principle, When the lagrargian function L is not an explicit function of time.

(b) What is numerical interpolation?

P.T.O.

2. Derive the canonical transformation equation and give the condition for the canonical transformation.

3. Solve the harmonic Oscillator problem by using Hamilton– Jacobi Theory.

4. Use the following date to find y = f(x) as a polynomial in x.

x	-1	0	1	2	3
y=f(x)	4	-4	0	16	68

5. Derive the Newton's Backward Difference formula.

SECTION – B

(Short – answer – type questions)

Note : Section 'B' contains Eight (08) short – answer type questions of Five (5) marks each. Learners are required to answer any Four (04) questions only.

(4×5 = 20)

1. Obtain the Lagrange's equation of motion for Atwood Machine and Simple Pendulum.

2. Using Lagrangian equation, discuss the motion of particle in polar coordinates.

P.T.O.

3. Define poission Bracket.

4. Describe with an example of numerical determination.

5. What are the conditions for transformation to be canonical?

6. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 0 using data given below.

x	0	2	4	6	8
y	5	13	85	269	613

7. Explain Simpson's one third rule.

8. Evaluate I = $\int_0^1 \frac{dx}{(1+x^2)}$ using Trapezoidal rule and a constant interval of 0.2.