S.No. 7378 **PN 15 PY 2**

(For candidates admitted from 2015–2016 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Part III – Physics

CLASSICAL DYNAMICS AND RELATIVITY

Time : Three hours Maximum : 100 marks

SECTION A — ($10 \times 2 = 20$)

Answer ALL questions.

1. What are internal and external forces?

2. Write down the difficulties introduced by constraints.

3. What are Eulerian angles?

4. List some uses of artificial satellites.

5. Write down the condition for a transformation to be canonical.

6. Give the equation of motions in terms of Poisson bracket.

7. List some properties of solitons.

8. Explain period doubling Phenomenon.

9. What is a Minkowski force? Give its equation.

10. Give the postulates of special theory of relativity.

SECTION B — (5 × 7 = 35)

Answer ALL questions choosing either (a) or (b)

11. (a) Write short notes on symmetry properties of space and time.

Or

(b) Obtain the equation of motion of a At wood machine by using lagrangian method.

12. (a) Explain the transformation from one set of axes to other using Euler's angles.

Or

(b) Obtain relation for dispersion and draw the dispersion curve.

13. (a) State and explain the principle of least action.

Or

(b) Show that the transformation $Q = \log(1/q \sin p)$ and $p = q \cot p$ is a canonical transformation.

14. (a) Write short notes on non linear oscillators.

Or

(b) Write short notes on solitary waves.

15. (a) Prove that the three dimensional volume element dxdydz is not invariant under Lorentz transformation While the four dimensional volume element dxdydzdt is invariant.

Or

(b) What is minkowski's space and four vector? Derive energy momentum four vector.

SECTION C — (3 × 15 = 45)

Answer any THREE questions.

16. Derive Lagrangian equation from D'Alembert's Principle.

17. Give the theory of small oscillations and obtain the characteristic eigen value equation.

18. Derive Hamilton's canonical equation of motion.

19. Explain how kdv equation describes the Scott Russel phenomenon.

20. Discuss the composition of Lorentz transformation about two orthogonal directions.

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