MAY 2022 **P/ID 37519/PMA4V**

Time : Three hours Maximum : 80 marks

PART A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. Write the equation for motion the system of N particles.

2. Define a Bilateral constraint.

3. Define an inertia coefficients.

4. What are two general approaches of classical dynamics?

5. What is an orthogonal system?

6. What is the necessary and sufficient condition for the function f has stationary value.

7. Define a contemporaneous.

8. Define an exact differential equation of Pfaffian form.

9. Write a equation of Pfaffian form Ω in the n variables $x_1, x_2, ..., x_n$.

10. Define a Point transformations.

11. State the Jacobi identity.

12. Define a contact transformation.

PART B — (5 × 6 = 30 marks)

Answer any FIVE questions.

13. Three particle are connected by two rigid rods having a joint between them to form the system. A vertical force F and a moment M are applied. The configuration of the system is given by the ordinary coordinates (x_1, x_2, x_3) or by the generalized coordinates (q_1, q_2, q_3), where $x_1 = q_1 + q_2 + \frac{1}{2}q_3, x_2 = q_1 - q_3,\ x_3 = q_1 - q_2 + \frac{1}{2}q_3$. Find the generalized force Q_1, Q_2 and Q_3.

14. Explain the Holonomic constraints.

15. Discuss the Kepler problem for ignorable coordinates.

16. Explain the natural system.

17. Derive the Modified Hamilton's principal equation.

18. Derive the Lagrange bracket equation.

19. Discus the canonical transformation.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. State and prove the principle of virtual work.

21. Derive the Lagrange form of d'Alembert's principle.

22. Derive the Euler Lagrange equation.

23. Derive the modified Hamilton Jacobi equation.

24. Prove that the transformation $Q = \sqrt{2q}e^{t} \cos p$ and $P = \sqrt{2q}e^{-t} \sin p$ is canonical.

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