DECEMBER 2022 **P/ID 37519/PMA4V**

Time : Three hours Maximum : 80 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Define degrees of freedom.

2. What is a conservative force?

3. Define an Angular momentum.

4. Write the equation of Jacobi integral.

5. Define ignorable coordinates.

6. What is a saddle point?

7. Define a noncontemporaneous variation.

8. What is the first Pfaff's system?

9. Write the transformation equation in 2n space.

10. What is the momentum transformation?

11. State Poisson's theorem.

12. Define Kronecker delta.

PART B — (5 × 6 = 30 marks)

Answer any FIVE questions.

13. State and prove the Konig's theorem.

14. Discuss generalized force.

15. Explain the Routhian function.

16. Discuss the Liouville's system.

17. Derive the principle of least action.

18. Prove that the transformation $Q = \sqrt{e^{-2q} - p^2}$ and $P = \cos^{-1}(pe^q)$ is canonical.

19. Derive Poisson Bracket.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. A particle of mass m is suspended by massless wire of length $r = a + b\cos\omega t, (a > b > 0)$ to form a spherical pendulum. Find the equation of motion.

21. Find the differential equations of motion for a spherical pendulum of length l.

22. Derive the Hamiltonian equation of motion.

23. State and prove the Stackel's Theorem.

24. Prove that the transformation

$Q = \frac{1}{2}(q^2 + p^2)$, $P = -\tan^{-1}\frac{q}{p}$ is canonical.
