DECEMBER 2024 **P/ID 37519/PMA4V**

Time : Three hours Maximum : 80 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions.

1. Define a generalized coordinates.

2. Define a configuration space.

3. What is a gravitational coefficient?

4. What is conservative system?

5. What is extended configuration space?

6. What is a stationary values of a function?

7. Define a integrals of the motion.

8. What is the canonical integral?

9. Define a characteristic function.

10. What is point transformation?

11. What is contact transformation?

12. What is a momentum transformation?

PART B — ($5 \times 6 = 30$ marks)

Answer any FIVE questions.

13. State and prove Konig's theorem.

14. Explain potential energy.

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

16. Discuss principle of least action.

17. State and prove the Hamilton's principle.

18. Prove that the transformation $Q = \frac{1}{2}\left(q^2 + p^2\right)$, $P = -\tan^{-1}\frac{q}{p}$ is canonical.

19. Derive the Lagrange brackets.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. State and prove the principle of virtual work.

21. Derive the Lagrange form of d'Alemberts principle.

22. Derive the Euler-Lagrange equation.

23. Derive modified Hamilton Jacobi equation.

24. Consider the transformation $Q = q - tp + \frac{1}{2}gt^2$, $P = p - gt$. Find $K - H$ and the generating function.

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