

MAY 2016

P/ID 37479/PMANJ

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Time : Three hours

Maximum : 100 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define holonomic constraints.
2. Define workless constraint.
3. Define Routhian function.
4. Define a conservative system.
5. State Hamilton's principle.
6. Write Hamilton's principle function.
7. Write contact transformation.
8. State Poisson's theorem.
9. What is time dilation?
10. What is world line?

SECTION B — (5 × 7 = 35 marks)

Answer any FIVE questions.

11. Explain the Lagrangian form of d' Alembert's principle.
12. Prove that the generalized momentum corresponding to each ignorable coordinate is constant.
13. Discuss Liouville's system.
14. Derive Jacobi's form of principle of least action.
15. State and prove Poisson's theorem.
16. Consider the transformation
$$Q = \sqrt{e^{-2q} - p^2}, \quad P = \cos^{-1}(pe^q).$$
Use Poisson bracket to show that it is canonical.
17. Explain the Ether theory.
18. Explain the momentum-energy fourth vector.

SECTION C — (3 × 15 = 45 marks)

Answer any THREE questions.

19. State and prove König's theorem.
20. Define Routhian function and prove that

$$\frac{d}{dt} \left( \frac{\partial R}{\partial \dot{q}_i} \right) - \frac{\partial R}{\partial q_i} = 0 \quad (i = k + 1, \dots, n).$$

21. Derive Hamilton's canonical equation of motion.
  22. Explain the principal forms of generating functions.
  23. Derive the Lorentz transformation equations.
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