SUBJECT CODE : 11MT/PC/ME14

M. Sc. DEGREE EXAMINATION, NOVEMBER 2014
BRANCH I - MATHEMATICS
FIRST SEMESTER

COURSE : CORE
PAPER : MECHANICS
TIME : 3 HOURS   MAX. MARKS : 100

SECTION – A   **(5 X 2 = 10)**

ANSWER ALL THE QUESTIONS

1. Define holonomic and non-holonomic constraints.

2. Define ignorable coordinates.

3. State Euler's theorem.

4. Define Legendre transformation.

5. Write any two properties of Poisson brackets.

SECTION – B   **(5X 6 = 30)**

ANSWER ANY FIVE QUESTIONS

6. State and prove De Alembert's principle.

7. Find the shortest distance between two points in the plane using calculus of variation.

8. Prove that $\left[\frac{dG}{dt}\right]_{space} = \left[\frac{dG}{dt}\right]_{body} + \omega \times G$.

9. Derive Hamilton's equations of motion.

10. State and prove Jacob's identity.

11. Discuss the problem of Atwood's Machine using Lagrange's formulation.

12. Verify the canonical invariance of Lagrange bracket.

SECTION – C   **(3X20 = 60)**

ANSWER ANY THREE QUESTIONS

13. State and prove conservation theorem for the linear momentum and the total angular momentum of a system of particles.

14. Derive Lagrange's equation for holonomic system using Hamiltan's principle.

15. a) Derive Euler's equation of motion for a rigid body with one point fixed.

    b) State and prove parallel axes theorem for moment of inertia.

16. State and prove the principle of least action.

17. Solve the problem of the simple harmonic oscillator in one dimension using a canonical transformation.

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