15071

M.Sc. DEGREE EXAMINATION, NOVEMBER 2016.

FIRST SEMESTER

Physics

Paper I – CLASSICAL MECHANICS AND THEORY OF RELATIVITY

Time : Three hours Maximum : 75 marks

(No additional sheet will be supplied)

SECTION A — (5 × 3 = 15 marks)

Answer any FIVE questions.

Each question carries 3 marks.

Each answer should not exceed 1 page.

1. Define degrees of freedom and discuss generalized coordinates.

2. State and explain principle of virtual work.

3. What is generating function and write its properties?

4. Discuss small oscillations and normal modes.

5. Write about Rutherford scattering.

6. Discuss Larmour precision.

7. Write the postulates of special theory of relativity.

8. Explain the motion of a particle in electric field.

SECTION B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. (a) Obtain Lagrange's equation from D'Alembert's principle.

   (b) Solve the problem of simple pendulum using Lagrange's equation.

Or

10. (a) Obtain Hamilton's equation of motion.

    (b) Obtain the expression for energy of harmonic oscillator using hamilton equation.

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11. (a) Derive the canonical equations in terms of Poisson bracketl.

(b) Explain Lagrangian bracket with examples.

Or

12. (a) Obtain Hamilton-Jacobi equations from Hamilton's principle.

(b) Solve the Kepler's problem in action angle variables.

13. (a) Discuss the motion of a body in a central force field.

(b) Explain Kepler's laws of planetary motion.

Or

14. (a) Obtain Euler's equations of a rigid body.

(b) Discuss the motion of symmetrical top.

15. (a) Derive Lorentz transformation equations.

(b) Discuss Doppler effect of light.

Or

16. (a) Discuss the motion of a single particle in magnetic field.

(b) Obtain the transformation equations of momentum.

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