08PPHCT1002 - PPH/CT/1002

M.Sc. DEGREE EXAMINATION, APRIL 2018
I YEAR - I SEMESTER
Major Paper II-CLASSICAL MECHANICS AND RELATIVITY

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20 marks)$

Answer any **TEN** questions

1. Write the characteristics of central forces between two bodies.
2. Define Lagrangian Function.
3. Name the important motion of a rigid body. How many numbers of independent co-ordinates are needed to specify the configuration of a rigid body in space?
4. Write the general expression for the rotational kinetic energy of a rigid body.
5. Write the canonical transformation equations.
6. Define the Poisson bracket of any two functions with respect to canonical variables.
7. Write the physical significance of theory of small oscillations.
8. What are the characteristics features of normal mode of vibration?
9. Define inertial and non-inertial frames.
10. Write the matrix form of four vectors.
11. Express the basic law on which the dynamical equation of motion of a rigid body is based upon.
12. Write the relativistic Hamiltonian of a single particle.

Section B $(5 \times 5 = 25 marks)$

Answer any **FIVE** questions

13. State the Keplers law of planetary motion.
14. Write short notes on Eulers equations of motion.
15. List out the fundamental properties of Poisson Brackets.
16. Discuss the theory behind the Hamilton-Jacobi equations.
17. Write the Lorentz transformation equations.
18. Define cyclic co-ordinates. Generalized momentum conjugate to cyclic coordinate is conserved. True or False. Justify.
19. Show that the mechanical properties of a closed system remain unchanged by any parallel displacement of the entire system in space.

P.T.O.

Section C $(3 \times 10 = 30 marks)$

Answer any **THREE** questions

20. Discuss the general features of motion under central force.

21. Define Eulers angle. Write the transformation matrix for rotation through an angle called precession, nutation and body.

22. Determine the solution for motion of a one dimensional harmonic oscillator using Hamilton Jacobi method.

23. Sketch the normal modes of vibration of a linear triatomic molecule in the increasing order of frequency.

24. Obtain the four vector form of Maxwells equation.