FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2016

(Regular/Supplementary/Improvement)

(CUCSS-PG)

CC15P PHY1 C01 – CLASSICAL MECHANICS

(Physics)

(2015 Admission Onwards)

Time: Three Hours   Maximum: 36 Weightage

Section A . Weightage 1 each

1. Briefly explain chaotic attractors.

2. State and explain D`Alembert`s principle.

3. What is meant by Legendre Transformation?

4. What is inertia Tensor? Give its physical significance.

5. What is meant by stable and unstable equilibriums in the case of small oscillations?

6. What is a logistic map? What are the fixed points of an iterated map?

7. Explain the principle of Least action..

8. Explain space fixed and body fixed system of coordinates

9. Is the Legrangian formulation is more advantageous than Newtonian formulation?

10. What is meant by moment of inertia tensor?

11. Write a short note on Poisson`s theorem.

12. What are principal axes and principal moments of inertia?

[12 X 1 = 12 Weightage]

Section B. Weightage 6 each (Answer any <u>Two</u> questions)

13. What is differential scattering cross section? Derive the Rutherford formula for

     scattering cross section in a central force field scattering?

.   14. Discuss the general theory of small oscillations and deduce the eigen value equation.

15. Obtain an expression for Coriolis force. Using this , deduce an expression for the deviation produced by a freely falling body to the surface of the earth.

16. Derive Euler`s equations of motion for rigid bodies. Explain the torque free motion of a symmetric top.

[2 X 6 =12 Weightage]

Section C. Weightage 3 each (Answer any <u>Four</u> questions)

17. Discuss the iteration of logistic equation,$x_{n+1} = A\, x_n(1-x_n)$,where A is the control parameter with A=2, 3.2, &   4

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18. Solve the linear harmonic oscillator using Hamilton-Jacobi equation.

19. Prove that Poisson Bracket of two dynamical variables is invariant under canonical transformation

20. A pendulum has a bob of mass m with a mass m_1 at the moving support. Mass m_1 moving in a horizontal line in the vertical plain in which the pendulum oscillates. Find the normal frequencies and normal modes.

21. Prove that $[\, L_x ,L_y \,] = L_z$

22. If $[\, \alpha,\beta]$ is the Poisson Bracket , prove that $d/dt\, (\, \alpha,\beta) = [d\alpha/dt,\, \beta] + [\, \alpha,\, d\beta/dt]$.

[4 X 3 =12 Weightage]

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