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D 33336 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, FEBRUARY 2013

(CUCSS)

Physics

PHY 1C 01—CLASSICAL MECHANICS

(2010 Admissions)

Time : Three Hours Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries a weightage of 1.

1. Discuss D'Alembert's principle.
2. State and explain the principle of least action.
3. Explain the advantages of using generalised co-ordinates.
4. Write a note on infinitesimal Canonical transformation.
5. Give the physical significance of Hamiltons characteristic function.
6. Explain the advantage of using action angle variables.
7. Distinguish between space fixed and body fixed system of co-ordinates.
8. What are Euler's angles.
9. Explain principal axis transformation.
10. What are normal co-ordinates.
11. Explain Singular points of trajectories.
12. Define period doubling.

(12 × 1 = 12 weightage)

Section B

Answer any **two** *questions.*
Each question carries a weightage of 6.

13. Derive Lagrange's equation from Hamiltons principle.
14. Using Hamilton Jacobi equation deduce Schrödinger equation.
15. Prove that the angular momemtum of a rotating body is $\vec{J} = \vec{I}\,\vec{W}$ where $\vec{I}$ is the inertia tensor.
16. Obtain the eigen vectors and eigen values of small oscillations.

(2 × 6 = 12 weightage)

Turn over

Section C

Answer any **four** *questions.*
Each question carries a weightage of 3.

17. Set up the Lagrangian and hence find the equation of motion of a one dimensional harmo oscillator.

18. Show that the transformation $P = \frac{1}{2}(p^2 + q^2), Q = \tan^{-1}\frac{q}{p}$ is canonical.

19. Prove that Poisson bracket of two dynamical variables is variant under infinitesimal canon transformation.

20. Using the method of action angle variables, show that the frequency of a simple pendulan length 'l' executing oscillations is $\frac{1}{2\pi}\sqrt{(g/l)}$.

21. Deduce an expression for centrifugal force.

22. Show that the period of oscillations of a simple pendulum $T = T_0\left[1+\frac{\theta_0^2}{16}\right]$, where $T_0 = 2\pi$ and θ_0 is the amplitude of oscillations.

(4 × 3 = 12 weight