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DEPARTMENT OF SCIENCES, I SEMESTER M.Sc (PHYSICS) END SEMESTER EXAMINATIONS, DECEMBER 2018 CLASSICAL MECHANICS - SUBJECT [CODE- 4103] (REVISED CREDIT SYSTEM-2018)

Time: 3 Hours Date: 24/12/2018 MAX. MARKS: 50

Note: (i) Answer ALL questions

(ii) Draw diagrams, and write equations wherever necessary

1 A. (a) Show that the work done by external force in displacing a particle in a conservative field is equal to the difference between the potential energies of the particle in those two positions.

(b) Show that the total energy of a particle in a conservative field is constant, if potential energy is not depends on time. [2+3=5]

1 B. Discuss the motion of a projectile projected to space with no resistance, at an angle α with respect to ground and obtain expressions for time of flight and range. [5]

2 A. What do you mean by Conservative forces? Explain. In a conservative central force field show that the areal velocity of the system of two bodies is constant. [1+4=5]

2 B. What do you mean by Coriolis force? Explain. Show that the angular acceleration is the same in the fixed and rotating frames. [2+3=5]

3 A. What do mean by constraints? Explain with an illustration. Obtain Lagrange's Equations of motion for both conservative and non conservative forces using D'Alembert's principle. [2+3=5]

3 B. Obtain Lagrangian for a spherical pendulum and hence obtain the equations of motion [5]

4 A. Write the torque-free Euler's equation of motion of a symmetric top and arrive at its solution.

[5]

4 B. What do you mean by phase space? Explain. Show that the transit time t_{12} is minimum along the path of the cycloid. [2+3=5]

5 A. Explain generating functions. What do you mean by point transformation? Explain with an example. [3+2=5]

5 B. Define Poisson Bracket [PB]. Prove that PBs are invariant under canonical transformations. [2+3=5]