

**TEZPUR UNIVERSITY**  
**Assignment Spring 2022**  
**MMS 301 : Classical Mechanics**  
**Total Marks: 30**

*The figures in the right-hand margin indicate marks for the individual question.*

*All questions are compulsory.*

*Answers should be concise and entire answer to a question should be together. State assumptions wherever made.*

1. A particle of mass  $m$  which was at rest at a height  $h$  starts falling vertically downward through the atmosphere at time  $t = 0$ . If the viscous force offered by the atmosphere is proportional to the instantaneous velocity of the particle, then
  - (a) write down Newton's equation of motion and solve it to find the position of the particle as a function of time. [6]
  - (b) Deduce the expression of the critical velocity of the particle. [3]
  - (c) Find the time required for the particle to fall through half the initial height of the particle. [3]
2. State and explain Kepler's laws of motion. Deduce polar form of the equation of planetary orbits. [2 + 4 = 6]
3. What are Canonical Transformations? Describe the four types of Generating Functions of Canonical Transformations. [2 + 4 = 6]
4. Define and deduce the properties of Poisson's Brackets. Derive the equation of motion in term of Poisson's Brackets. [3 + 3 = 6]

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