

PARUL UNIVERSITY
FACULTY OF APPLIED SCIENCE
M.Sc., Winter 2017-18 Examination

Semester: 1
Subject Code: 11204102
Subject Name: Classical Mechanics-I & Statistical Mechanics

Date: 20/12/2017
Time: 02:00 pm to 04:30 pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

- Q.1. A) Answer the following questions (Each of 04 marks) (08)**
- (a) Explain Gauge transformation
 - (b) Derive The Hamilton Jacobi equations.
- Q.1. B) Answer the following questions (Any two) (04)**
- (a) (04)
 1. Write condition for orthogonality of eigen vectors
 2. Write canonical equations in terms of Poisson bracket notation.
 - (b) Explain Motion of a symmetric top. (04)
 - (c) Discus General case of coupled oscillations. (04)
- Q.2. A) Answer the following questions. (04)**
- (a) Short note/ Brief note (2x2)/ Fill in the blanks. (Each of 02 marks) (04)
 1. Define Eigen vectors and Eigen frequencies.
 2. Write condition for transformations to be Canonical
 - (b) Explain small oscillations of particles on string. (04)
- Q.2. B) Answer the following questions (Any two) (03)**
- (a) Short note/ Multiple choice questions. (Each of 01 marks) (03)
 1. Write the equation of Poission bracket
 2. Write equation of kinetic energy in terms of normal coordinator.
 3. What is kronecker delta?
 - (b) Using poission bracket, show that $q=\sqrt{2p}\sin Q$ and $p=\sqrt{2q}\cos Q$ are canonical (03)
 - (c) Derive Relation between infinitesimal transformation. (03)
- Q.3. A) Answer the following questions (08)**
 Derive Wiener-Khincing Theorem.
- Q.3. B) Answer the following questions (Any two) (04)**
- (a) Show that in the second order phase transition the second derivatives of the Gibbs function is discontinuous (04)
 - (b) Explain Critical Parameter in short. (04)
 - (c) Explain first order phase transition in short. (04)
- Q.4. A) Answer the following questions. (04)**
- (a) (04)
 1. Discuss the usefulness Wiener-Khinching Theorem.
 2. Explain Critical Indices in short.
 - (b) Write Short note on Van der Waal's theory of Liquid-Gas transition (04)
- Q.4. B) Answer the following questions (03)**
- (a) Short note/ Multiple choice questions. (Each of 01 marks) (03)
 1. Define triple point.
 2. Define Brwonian Motion.
 3. What is diffusion coefficient?
 - (b) Write down the Fokker-Planck equation and explain its terms. (03)