Seat No:_____ **Enrollment No:_____**

PARUL UNIVERSITY

FACULTY OF APPLIED SCIENCE

M.Sc., Summer 2017-18 Examination

Semester: 1 **Date: 23-05-2018**
Subject Code: 11204102 **Time: 10:30AM to 01:00PM**
Subject Name: Classical Mechanics-I & Statistical Mechanics **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) Brief note (Each of 04 marks) **(08)**
(a) Explain Gauge transformation,
(b) Using poission bracket, show that $q=\sqrt{2}p\sin Q$ and $p=\sqrt{2}q\cos Q$ are canonical

Q.1. B) Answer the following questions (Any two)
(a) Short note (Each of 02 marks) **(04)**
1. Write the equation of Poission bracket
2. Write The Hamilton Jacobi equations.

(b) Write condition for transformations to be Canonical **(04)**
(c) Write equation of kinetic energy in terms of normal coordinator. **(04)**

Q.2. A) Answer the following questions.
(a) Short note/ Brief note (2x2)/ Fill in the blanks. (Each of 02 marks) **(04)**
1. Write conditions for orthogonality of Eigen vectors
2. Define Eigen vectors and Eigen frequencies.

(b) Explain Motion of a symmetric top. **(04)**

Q.2. B) Answer the following questions (Any two)
(a) Short note (Each of 01 marks) **(03)**
1. Mention the notation of all Euler's angles with dimensional diagram.
2. What do you mean by "Normal Coordinate"?
3. What is kronecker delta?

(b) Discus General case of coupled oscillations. **(03)**
(c) Explain small oscillations of particles on string. **(03)**

Q.3. A) Essay type/ Brief note (4x2) (Each of 04 marks) **(08)**
(a) Explain Langevin theory of Random motion
(b) Explain Power spectrum of fluctuation.

Q.3. B) Answer the following questions (Any two)
(a) Short note/ Brief note (2x2)/ Schematically label the figures (2x2) (Each of 02 marks) **(04)**
1. Write a short note on short noise
2. What is Nyquist theorem? Write its importance.

(b) Explain Jhonson Noise. **(04)**
(c) Derive Fokker-Planck equation. **(04)**

Q.4. A) Answer the following questions.
(a) Short note/ Brief note (2x2)/ Fill in the blanks. (Each of 02 marks) **(04)**
1. Explain Critical Indices in short
2. Explain first order phase transition in short.

(b) Write a Short note Wiwner-Khinching Theorem. **(04)**

Q.4. B) Answer the following questions (Any two)
(a) Short note/ Multiple choice questions. (Each of 01 marks) **(03)**
1. What is the temperature value of triple point of water.
2. What do you mean by phase diagram.
3. What is diffusion coefficient?

(b) Write Short note on Van der Waal's theory of Liquid-Gas transition. **(03)**
(c) Explain Critical Parameter in short. **(03)**