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B.Sc. (Sem.- V) Examination March - 2026

Physics (Paper - MJ-PH (TH) - 502

Classical and Statistical Mechanics

Time: 1 Hours] **[Total Marks: 25**

સૂચના : / Instructions

(1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
(2) Draw neat diagrams wherever necessary.
(3) Symbols used in the paper have their usual meaning.
(4) Figures to the right indicate full marks of the question.
(5) Scientific calculator may be used.

Seat No.:

Student's Signature

Q.1. Answer the following questions in brief: (Attempt any five) **5**

1. Mention Kepler's second law.
2. Give some example of motion under central force?
3. If a generalized co-ordinate of dimension of velocity, then what is the unit of Generalized velocities ?
4. Is an entropy an additive quantity?
5. Proton is ..... . (Fermion, Boson)
6. Give the value of potential energy of an ideal gas.

Q.2. (a) Attempt any one of the following in details: **7**

1. Derive Langrange's equation of motion from D'alembert's principle.
2. What is central force ? Using central force motion obtain conservation of angular momentum and prove the second law of Kepler's.

(b) Attempt any one of the following **3**

1. The periodic time of Mars is 687 days and that of Earth 365.26 days. Then find the ratio of the major axis of orbit of Mars and the Earth.
2. Consider a motion of particle in three dimensions under the force F, Obtain the Langrangian equations and show that they are equivalent to Newton's equations.

Q.3. (a) Attempt any one of the following in details: **7**

1. Deduce the relation $S = K_b \ln \Omega$.
2. Derive the Bose-Einstein distributive law.

(b) Attempt any one of the following **3**

1. The system consisting of two bosons which can exist in three different energy state. Calculate the number of ways in which these particles can be distributed in a given state.
2. Determine the phase path of linear harmonic oscillator.