Roll No. .....
500 -/-/15/20

DS-202

November – December 2019
M. Sc. Ist Semester Examination

PHYSICS
PAPER II : CLASSICAL MECHANICS

Time 3 Hours] [Max. Marks : Regular 85 / Private 100
[Min. Marks : Regular 28 / Private 33

Note : This question paper is meant for all Regular and Private students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. (a) What do you mean by Generalized co-ordinates ? Explain generalized momenta and Lagrangian formulation of the conservative theorems.
   (b) State Hamilton's principle and use it to obtain the equation of motion $mf = -\frac{\partial v}{\partial x}$.

OR

   (a) What is D' Alemberts principle ? Deduce Hamilton's principle from D' Alemberts principle.
   (b) Derive Lagrange's equation of motion from D' Alemberts principle.

2. (a) Write down the Hamilton-Jacobi equation and apply it to the problem of Harmonic oscillator.
   (b) Show that the transformation $Q = \frac{1}{p}$ and $P = qp^2$ is canonical.

OR

   (a) If H is the Hamiltonian and f is any function depending on position, momenta and time. Show that $\frac{df}{df} = \frac{\delta f}{\delta t} + [H, f]$
   where [ ] stands for Poisson bracket.
   (b) Obtain the expression for Rutherford scattering scross-section.

3. (a) What is meant by Coridis force ? Explain its terrestrial and astronomical applications.
   (b) Obtain Euler's equation of motion for a rotating rigid body.

OR

   (a) Explain angular momentum and inertia tenson.
   (b) Deduce the eigen value equation for small oscillations.

4. (a) Explain symmetries of Space and Time.
   (b) Explain covariant Hamiltonian.

OR

Explain with example variance under Lorentz transformation.

5. Write short notes on any two of the following :
   (a) Constraints with some examples.
   (b) Inverse central force field.
   (c) Acceleration in rotating frames.
   (d) Covariant Lagrangian.
