M.Sc. F.Y. (Physics) (CBCS Pattern) Semester - II

PSCPHYT07 - Core Paper-VII Classical Mechanics

P. Pages : 2 **GUG/S/23/11222**

Time : Three Hours * 1 4 0 0 * Max. Marks : 80

Either:

1. a) Obtain Lagrange's equation of motion from Hamilton's variational principle. **8**

b) Explain D'Alembert's principle. **8**

OR

e) Derive Lagrange's equation of motion from D'Alembert's principle. **8**

f) Discuss variational principle. **8**

Either:

2. a) Discuss Routh's procedure for cyclic co-ordinates. **8**

b) Explain Hamilton – Jacobi theory. **8**

OR

e) Define 'Hamiltonian Principle' obtain Hamilton's canonical equation of motion. **8**

f) Show that if a co-ordinate corresponding to a rotation is cyclic, rotation of the system about the given axis has no effect on the description of the system motion i.e. angular momentum is conserved. **8**

Either:

3. a) Establish a relation between scattering angles in laboratory system and centre of mass system. **8**

b) Obtain an expression for the reduced mass of the system. **8**

OR

e) A particle describing a closed orbit under the influence of a central force. Derive the quantities which remain invariant during the motion. **8**

f) Show that total energy and angular momentum of a particle under a central force is conservative. Also show that rate at which the area is swept out by the radius vector is constant. **8**

Either:

4. a) State and prove Euler's theorem. **8**

b) What do you understand by Normal Co-ordinates and normal modes of vibrations? **8**

OR

e) Explain moment of inertia tensor. **8**

f) Explain periodic motion in small oscillations. **8**

5. Answer all the followings:

a) Using Lagrange's equation of motion for conservative system. Show that $ma = -\frac{\partial v}{\partial x}$ for a particle of mass 'm' moving with acceleration (a) in a potential (v) along x – direction. **4**

b) Discuss in brief Canonical transformations. **4**

c) Explain stability of orbit. **4**

d) Explain the term "Principal axes transformation". **4**

****