Shree H.N. Shukla College of Science
M.Sc. (Mathematics) Sem-1
IMP questions of Classical Mechanics-1

1. State and prove linear momentum conservation theorem for a single particle.
2. State and prove angular momentum conservation theorem for a single particle.
3. Explain in detail the conservation of energy for a single particle.
4. State and prove linear momentum conservation theorem for a system of particle.
5. State and prove angular momentum conservation theorem for a system of particle.
6. If the mass of body is concentrated about C.M. then Show that total angular momentum of the system is equal to the angular momentum of C.M. plus angular momentum about C.M.
7. If the mass of body is concentrated about C.M. and moving with it then Show that total K.E. of the system is equal to the K.E. at C.M. plus K.E. about C.M.
8. State D'Alembert principle & using it derive Lagrange's equation of motion for general system.
9. Derive Lagrange equation of motion for conservative holonomical system.
10. Find the equation of motion for a particle of mass m and moving in space (A)Cartesian co-ordinates (B)Plane polar co-ordinates
11. Describe Atwood machine and derive Lagrange equation of motion for Atwood machine
12. A bead sliding on a uniformly rotated wire in a force free space then find the equation of motion
13. Obtain Lagrange equation of motion for a simple pendulum
14. State Hamilton Variational principle also discuss techniques of calculus of variations.
15. State Hamilton's variational principle and using it derive Lagrange equation of motion

16. Find the shortest distance between two points in a plane using variational principle
17. Find minimum surface of revolution about Y-axis using variational principle
18. Discuss the Brachestochrone Problem.
19. A particle falls a distance y_0 in time $t_0 = \sqrt{\frac{2y_0}{g}}$, if the distance y at any time t is $y = at + bt^2$ then show that the Integral $\int_0^{t_0} Ldt$ is extremum for real values of the coefficients only when $a = 0 \ \& \ b = g/2$
20. A loop rolling without slipping down on inclined plane then find the force of fricline acting on the loop.
21. Show that the central force motion of two bodies about their C.M. can always be reduced to an equivalent one body problem.
22. Derive the equation of motion & first integral for two body central force problem.
23. A particle of mass m moves under a central force then show that (A)its orbit is a plane curve (B)its areal vector swepts out equal area in equal time.
24. Discuss in detail the use of direction cosines to specify the orientation of a rigid body.
25. Obtain the matrix for the two dimensional orthogonal transformation.
26. Define Euler angles & obtained the transformation matrix from space axis to body axis.
27. Discuss in detail the cayley-klein parameter & obtain the orthogonal matrix of transformation in terms of these parameter.