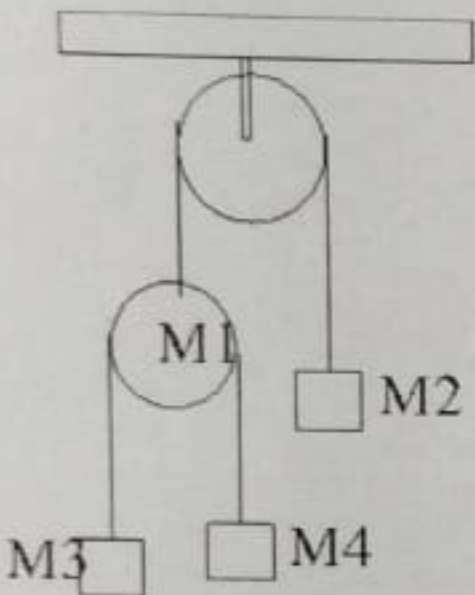# Minor 1
## CLASSICAL MECHANICS (Marks 20)



1) A mass M2 hangs at one end of a string which passes over a fixed frictionless non-rotating pulley. (See figure attached) At the other end of this string there is a non-rotating pulley of mass M1 over which there is a string carrying masses M3 and M4. Set up the Lagrangian for the system and obtain the equation of motion.　(6)

2) Find the number of generalized coordinates for the given systems.
   a) Two masses are constrained to move in a parabolic path given by $z = b y^2$ in the y-z plane (b is a constant).
   b) Two particles are constrained to move in a three dimensional potential given by $V(r)$
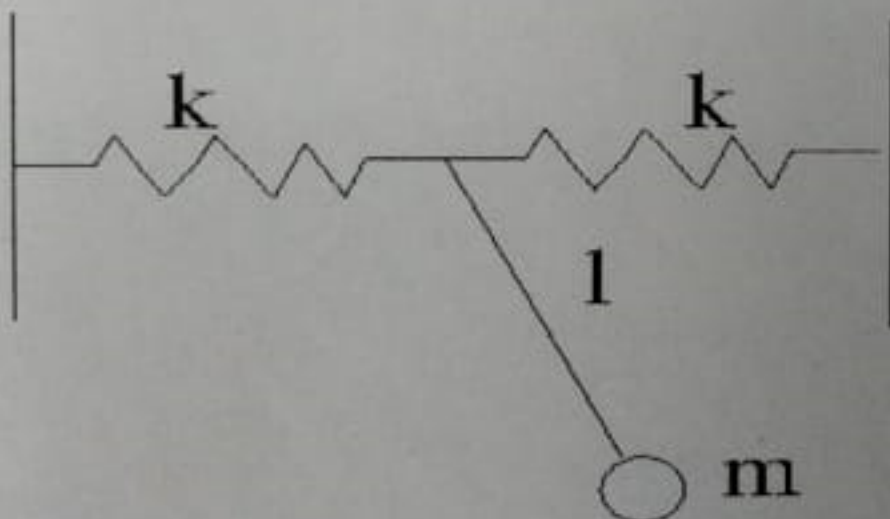
   (4)



3) In fig 2, we have a smooth conical (frictionless) spiral. The bead is constrained to move along the spiral. Write the Lagrangian and find the equations of motion of the bead given that the distance of the bead from the z- axis is $\rho = az$ and the angle in x-y plane is given by $\varphi = -bz$. "a " and "b " are constants.

   (5)
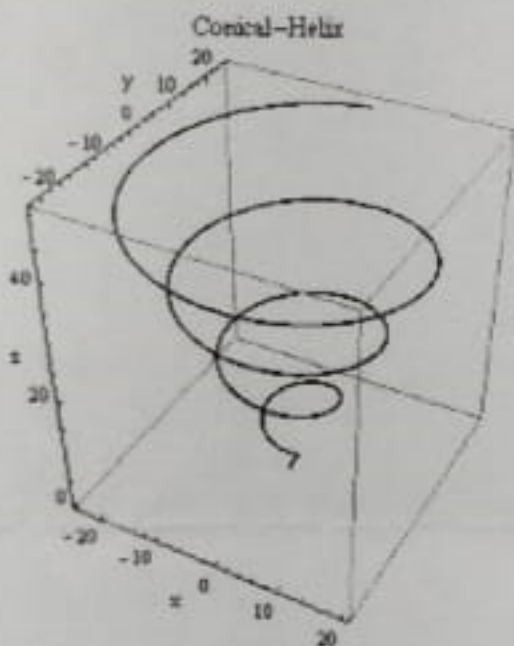
4) For the given figure below, obtain the Lagrange's equation of motion



(5)