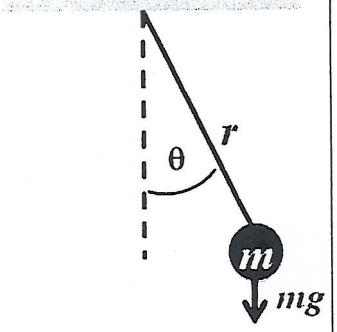
淡江大學 100 學年度轉學生招生考試試題

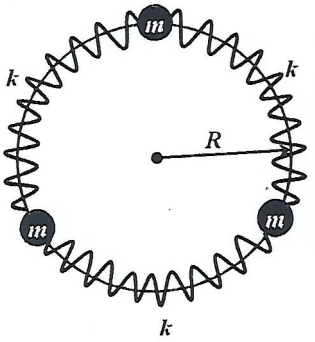
系別：物理學系三年級　　科目：理 論 力 學

考試日期：7 月 19 日(星期二) 第 3 節　　本試題共 4 大題， 1 頁

1. A simple pendulum of mass ***m*** is in a constant gravitational field (gravitational constant ***g***). Please derive the equation of motion of this spring pendulum in
   (a)[10%] Newton's law
   (b)[10%] Lagrange's theory
   (c)[10%] Hamiltonian's theory



2. Three mass points of mass ***m*** move on a circle of radius of ***R***. Each mass point is coupled to its two neighboring mass points by an identical spring with the spring constant ***k***.
   (a)[10%] Find the Lagrangian and derive the equations of motion of this system.
   (b)[10%] Find the eigenfrequencies (normal frequencies)
   (c)[10%] Find the corresponding eigenvectors for the frequencies in (b)



3. Consider two identical bowling balls (with the same mass M), the 1st one moves toward the 2nd one which is at rest, as shown in the figure. Assuming both are hard spheres, please find
   (a) [10%] the differential cross section
   (b) [10%] the total cross section

   [Hint: $2\pi\sigma(\psi)\sin\psi d\psi = -2\pi b db$]

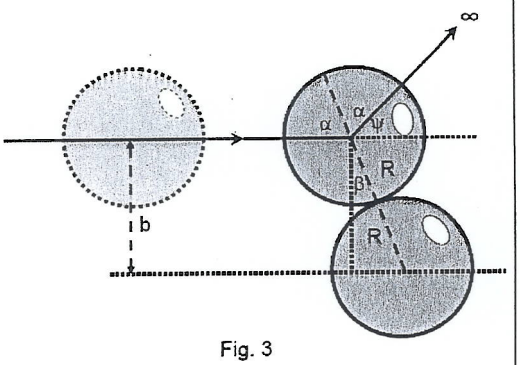


Fig. 3

4. Please determine the (a) [10%] principle axes and (b)[10%] principle moments of a uniformly *solid hemisphere* of radius of ***b*** and mass ***m*** about its center of mass (CM).