Theoretical Problem 3

COLLISION OF DISCS WITH SURFACE FRICTION

A homogeneous disc A of mass m and radius R_A moves translationally on a smooth horizontal x-y plane in the x direction with a velocity V (see the figure on the next page). The center of the disk is at a distance b from the x-axis. It collides with a stationary homogeneous disc B whose center is initially located at the origin of the coordinate system. The disc B has the same mass and the same thickness as A, but its radius is R_B. It is assumed that the velocities of the discs at their point of contact, in the direction perpendicular to the line joining their centers, are equal after the collision. It is also assumed that the magnitudes of the relative velocities of the discs along the line joining their centers are the same before and after the collision.

1) For such a collision determine the X and Y components of the velocities of the two discs after the collision, i. e. V'_{AX}, V'_{AY}, V'_{BX} and V'_{BY} in terms of m, R_A, R_B, V and b.

2) Determine the kinetic energies E'_A for disc A and E'_B for disc B after the collision in terms of m, R_A, R_B, V and b.

