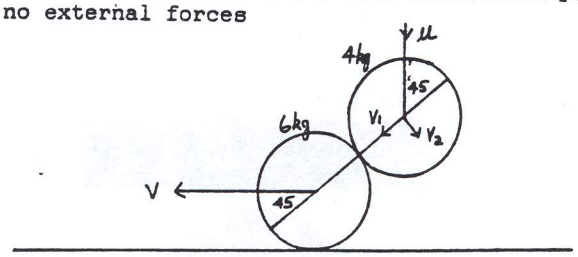
1990

Q. 5

(i) The 6 kg mass rests on a smooth horizontal plane - no external forces

(ii)



$v_2 = u \sin 45$

P.C.M. horizontal direction

$6(0) + 4(0) = 6v + 4 v_1 \sin 45 - 4 v_2 \sin 45$ (1)

N.I.R. along line of centres

$v \cos 45 - v_1 = - e (0 - u \cos 45)$ (2)

Solve (1), (2) for $v \Rightarrow$ $v = \dfrac{u(1 + e)}{4}$

(iii) $e = 1/3 \quad \Rightarrow \quad v = u/3$

$\Rightarrow \quad v_1 = \dfrac{v}{\sqrt{2}} - \dfrac{eu}{\sqrt{2}} = 0$ and $v_2 = \dfrac{u}{\sqrt{2}}$

K.E. before $= \frac{1}{2}(4) u^2 = 2 u^2$

K.E. after $= \frac{1}{2}(6) v^2 + \frac{1}{2}(4)(v_1^2 + v_2^2) = \dfrac{4u^2}{3}$

Loss in K.E. $= \dfrac{2u^2}{3}$

Q. 6