7. Particle A has mass $3m$ and particle B has mass $2m$.

The particles are moving in the **same** direction along the same straight line on a smooth horizontal surface.

Particle A collides directly with particle B.

Immediately before the collision, the speed of A is $2u$ and the speed of B is u.

Immediately after the collision, the direction of motion A is unchanged.

The coefficient of restitution between A and B is e.

(a) Show that the speed of B immediately after the collision is $\frac{u}{5}(8 + 3e)$

(5)

Given that $e = \frac{1}{4}$

(b) find the percentage of kinetic energy lost in the collision.

(5)

After the collision, B hits a smooth fixed vertical wall that is perpendicular to the direction of motion of B.

Particle B rebounds and there is a second collision between A and B.

- the first collision between A and B occurs at a distance d from the wall
- the time between the two collisions between A and B is $\frac{60d}{91u}$

The coefficient of restitution between B and the wall is f.

(c) Find the value of f.

(5)

(Total for Question 7 is 15 marks)

TOTAL FOR PAPER IS 75 MARKS