2. Answer either (a) or (b):

(a) Explain the meaning of the term "impulse" and show how it is related to the change of momentum of a body. Describe the difference between elastic and inelastic collisions, indicating the laws you would use to solve problems for each case. **[10]**

A stone of mass 0.1 kg rests on a frictionless surface. A bullet of mass 2.5 g travelling parallel to the surface at 450 ms^{-1} strikes the stone and rebounds horizontally at right angles to its original direction with a speed of 300 ms^{-1}. Compute the magnitude and direction of the final velocity of the stone. Is the collision perfectly elastic? (Justify your answer.) If contact during the collision lasted for 1 μs calculate the average force exerted by the bullet on the stone. **[15]**

(b) Define the terms i) moment of inertia I, ii) torque $\boldsymbol{\tau}$, and iii) angular momentum **L**. Write down the vector relation representing Newton's Second Law in angular form. Under what circumstances is angular momentum conserved? **[10]**

A block A of mass m rests on a frictionless table. A cord attached to the block runs over a pulley P, with a frictionless bearing, on the edge of the table and is attached to a second block B of mass m hanging below. The pulley has a radius R and is in the form of a thin cylindrical ring of mass M with a hub and spokes of negligible mass. What is the moment of inertia of the pulley? When the system is released from rest calculate:

i) the linear acceleration of block A,
ii) the tension in the cord between A and P and
iii) the tension in the cord between P and B. **[15]**