Problem 1. If the car decelerates uniformly along the curved road from 25 m/s at A to 15 m/s at C, determine the acceleration of the car at B.

Problem 2. At the instant shown in figure, cars A and B are traveling with speeds of 18 m/s and 12 m/s, respectively. Also at this instant, A has a decrease in speed of 2 m/s², and B has an increase in speed of 3 m/s². Determine the velocity and acceleration of B with respect to A.

Problem 3. The smooth 2-kg cylinder C in figure has a pin P through its center which passes through the slot in arm OA. If the arm is forced to rotate in the vertical plane at a constant rate \( \Theta = 0.5 \text{ rad/s} \), determine the magnitude of velocity and acceleration of the cylinder at the instant \( \Theta = 60^\circ \).

Problem 4. The 0.5-kg ball of negligible size is fired up the smooth vertical circular track using the spring plunger. The plunger keeps the spring compressed 0.08 m when \( s = 0 \). Determine how far \( s \) it must be pulled back and released so that the ball will begin to leave the track when \( \Theta = 135^\circ \).

Problem 5. A 4-kg projectile travels with a horizontal velocity of 600 m/s before it explodes and breaks into two fragments A and B of mass 1.5 kg and 2.5 kg, respectively. If the fragments travel along the parabolic trajectories shown, determine the magnitude of velocity of each fragment just after the explosion and the horizontal distance \( d_B \) where segment B strikes the ground at D.