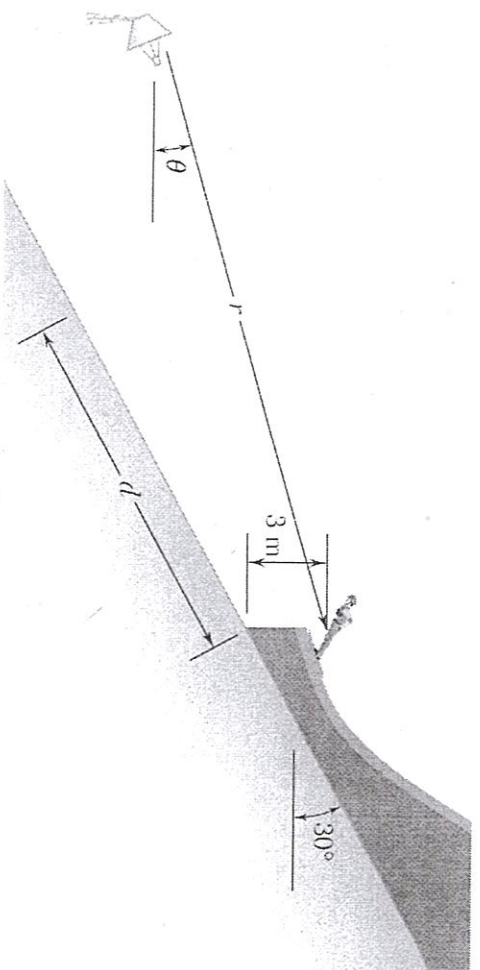


國立臺灣科技大學 103 學年度碩士班招生試題
系所組別： 自動化及控制研究所碩士班甲組
科目： 動力學

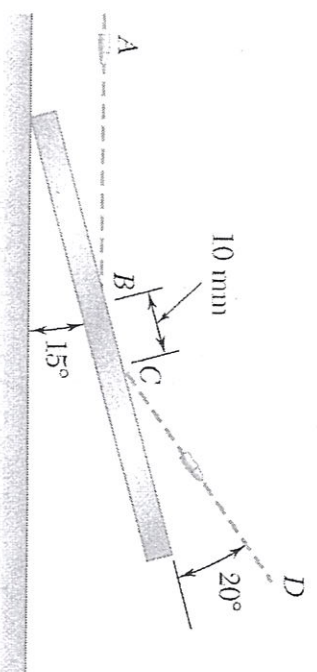
(總分為100分)

1. A telemetry system is used to quantify kinematic values of a ski jumper immediately before she leaves the ramp. According to the system $r = 150$ m, $\dot{r} = -31.5$ m/s, $\ddot{r} = -3$ m/s², $\theta = 25^\circ$, $\dot{\theta} = 0.07$ rad/s, and $\ddot{\theta} = 0.06$ rad/s², determine
 - (a) The velocity of the skier immediately before she leaves the jump. (5%)
 - (b) The acceleration of the skier at this instant. (10%)
 - (c) The distance of the jump d neglecting lift and air resistance. (10%)

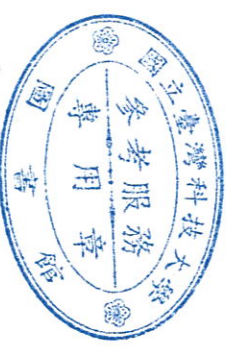


Problem 1

2. A 25-g steel-jacketed bullet is fired horizontally with a velocity of 600 m/s and ricochets off a steel plate along the path CD with a velocity of 400 m/s. Knowing that the bullet leaves a 10-mm scratch on the plate and assuming that its average speed is 500 m/s while it is in contact with the plate, determine the magnitude and direction of the average impulsive force exerted by the bullet on the plate. (10%)



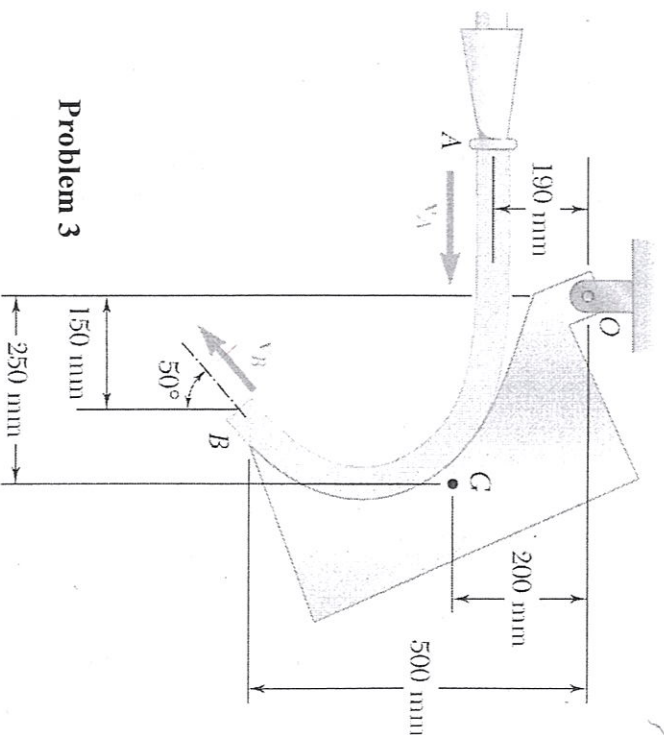
Problem 2



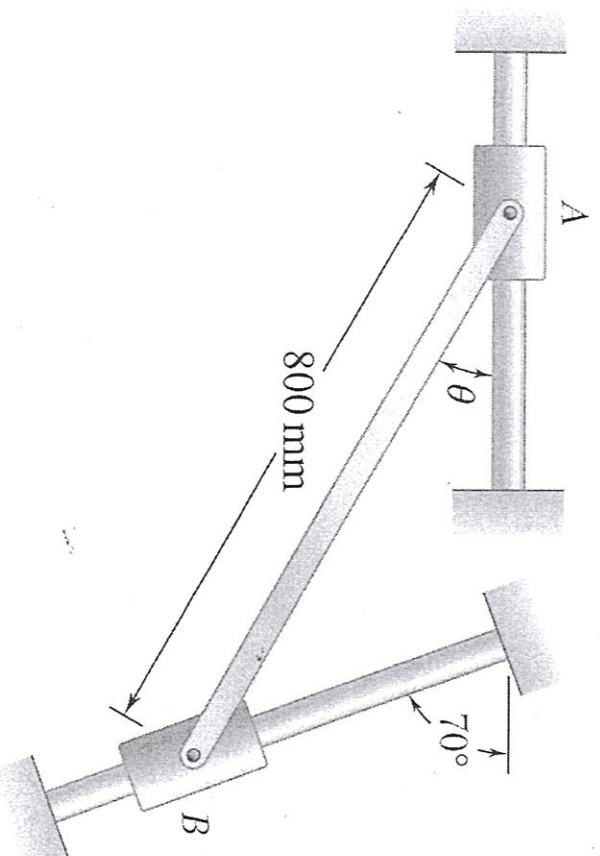
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(總分為100分)

3. A high-speed jet of air issues from the nozzle A with a velocity of v_A and mass flow rate of 0.36 kg/s . The air impinges on a vane causing it to rotate to the position shown. The vane has a mass of 6-kg . Knowing that the magnitude of the air velocity is equal at A and B , determine
- The magnitude of the velocity at A . (5%)
 - The components of the reactions at O . (10%)



4. The 2-kg uniform rod AB is attached to collars of negligible mass which may slide without friction along the fixed rods shown. Rod AB is at rest in the position $\theta = 25^\circ$ when a horizontal force \mathbf{P} is applied to collar A , causing it to start moving to the left with an acceleration of 4 m/s^2 . Determine
- The force \mathbf{P} . (8%)
 - The reaction at B . (7%)



Problem 4

