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國立臺北科技大學 106 學年度碩士班招生考試

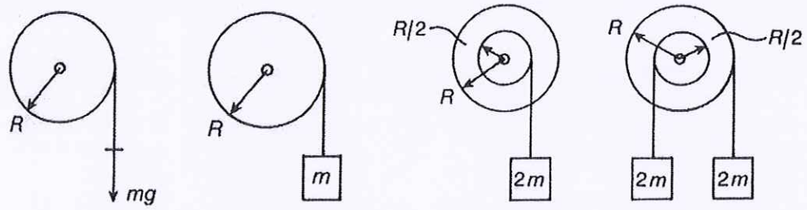
系所組別：1301 車輛工程系碩士班

第二節　動力學　試題　(選考)

注意事項：

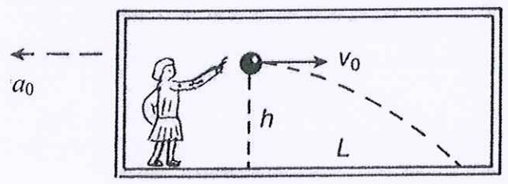
1.本試題共 5 題，每題 20 分，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. A wheel may rotate freely about its horizontal axis of symmetry. The moment of inertia is $mR^2/2$ regardless its shape. Determine the angular acceleration of the wheel for the four cases shown. (20%)



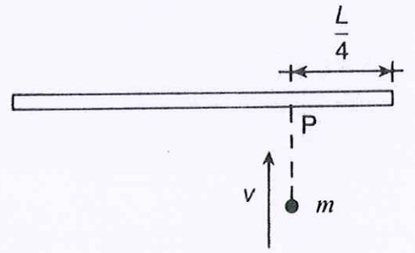
(a)　(b)　(c)　(d)

2. The brakes are applied to a train so that the magnitude of the acceleration has a constant value a_0 shown. A child throws a ball in the forward direction with a horizontal initial velocity V_0 with respect to the train. Determine the horizontal distance L reached by the ball. (20%)



3. Car **B** is 30 m behind car A. Both cars are travelling at the same velocity, 60 km/h, when car **B** starts an overtaking maneuver. During overtaking the acceleration of car **B** is 1.5 m/s^2 while car **A** continues at constant speed. The overtaking is considered to be completed when car **B** is 30 m ahead of car **A**.
   (1) Determine the time needed for car **B** to overtake car **A**. (Use the inertia frame of reference fixed to car **A**.) (10%)
   (2) Determine the distance alone the road needed for car **B** to overtake car **A**. Treats the cars as particles. (10%)

4. A bar of mass $4m$ and length L is resting on a smooth horizontal surface. A particle of mass m slides with velocity V normal to the bar. It hits the bar at a point **P** and becomes embedded in the bar. Determine the velocity of the midpoint of the bar immediately afterward. (20%)



5. Particles **A** of mass $4m$ and **B** of mass $3m$ are connected to an axis **EF** by light rods. The system is rotating about **EF**. In order to balance the system two small balancing weights are placed at **C** and **D**. Determine their masses. (20%)