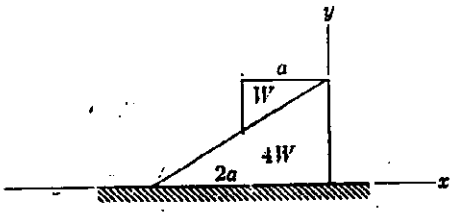
八十五學年度國立台灣工業技術學院研究所碩士班招生考試

所別：機械工程技術研究所　　組別：固力與設計組、控制組　　科目：動力學

共四題，每題25分，可不依序作答，但題號務必標示清楚。解題時請註明所依據之定律或原理，自由體圖須簡明繪於卷上，解題需自行定義代號或向量，亦請於圖上標示清楚。 $g = 9.81\ m/s^2$

1. Two smooth blocks whose cross sections are similar triangles are arranged on a smooth horizontal plane, as shown in the figure. The upper block weighs W NT, and the lower block weighs 4W NT. The blocks are held at rest in an initial position as shown. When they are released, the upper block slides down the lower block until it just touches the horizontal plane. Find the distance moved by the lower block during this process.



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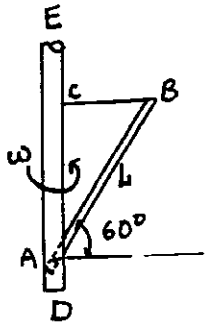
2. A slender rod AB of length L = 2.4 m and mass m = 20 kg is pinned at A to a vertical axle DE which rotates with a constant angular velocity ω of 15 rad/s. The rod is maintained in position by means of a horizontal wire BC attached to the axle and to the end B of the rod. Determine the tension in the wire and the reaction at A.



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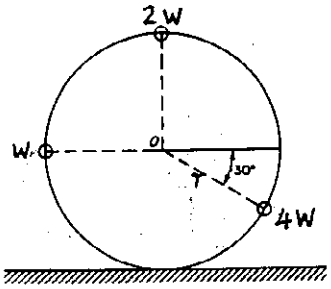
3. In the figure is shown a rigid ring to which are attached three particles whose relative weights are given. The ring is placed on a horizontal plane in this position with no angular velocity. What is the angular acceleration of the ring immediately after it is placed on the plane ? Assume that the ring itself has negligible weight and does not slip on the plane.



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4. The sheave of 400-mm radius has a mass of 50 kg and a radius of gyration of 300 mm. The sheave and its 100-kg load are suspended by the cable and the spring, which has a stiffness of 1.2 kN/m. If the system is released from rest with the spring initially stretched 100 mm, determine the velocity of point O after it has dropped 50 mm.