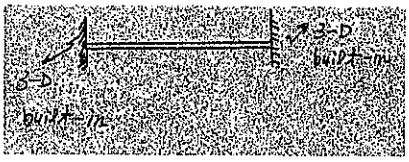
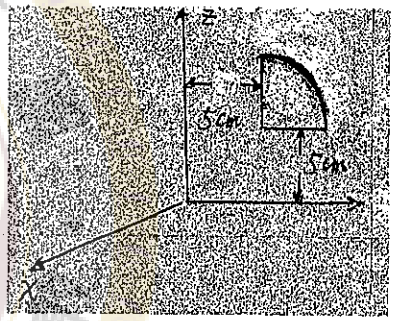
國立臺灣大學 103 學年度碩士班招生考試試題

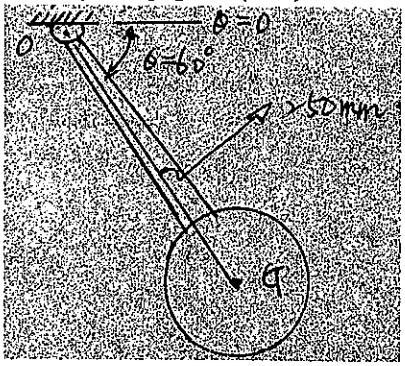
1. Draw the result of the Coulomb experiment for dry friction, and then define the corresponding impending condition and the coefficient of static friction. (10%)
2. What is a wrench? Try to prove the simplest resultants for a three dimensional forces system can be a wrench. (8%)
3. What are the degrees of indeterminancy in statics for a structure acted on by a force system? When a beam is built-in at two ends, tell me the corresponding degree of indeterminacy for this statically indeterminate beam (12%)



4. Try to give a statement and to do simple proof for the two theorems of Pappus. (10%)
5. As shown determine by using Pappus theorem the volume V generated by revolving the quarter-circular area of radius 5cm about the z-axis through an angle of 90°. (10%)



6. A pilot flies an airplane at a constant speed of 600km/hr in the vertical circle of radius 1000m. Calculate the force exerted by the seat on the 90-kg pilot at point of the highest level and at point of the lowest level. (10%)
7. Regarding to the impact between two spheres of the same size and same mass, what is the resilience coefficient of impact mechanically between them. Again, to prove the above coefficient can be expressed as the ratio of relative velocity of separation between spheres to that of approaching. (14%)
8. The pendulum has a mass of 7.5kg with center of mass at G, which has distance of 250 mm from the pivot O, and has a radius of gyration about the pivot O of 300 mm. If the pendulum is released from rest at $\theta = 0$, determine the total force supported by the bearing at the instant when $\theta = 60$. Friction in the bearing is negligible. (12%)



9. When a rigid body is being in a plane motion, what are the body and the space centrodes, and the relation between them. Again try to describe the above two centrodes when a cylinder is rolling without slipping on a plane (14%)

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