

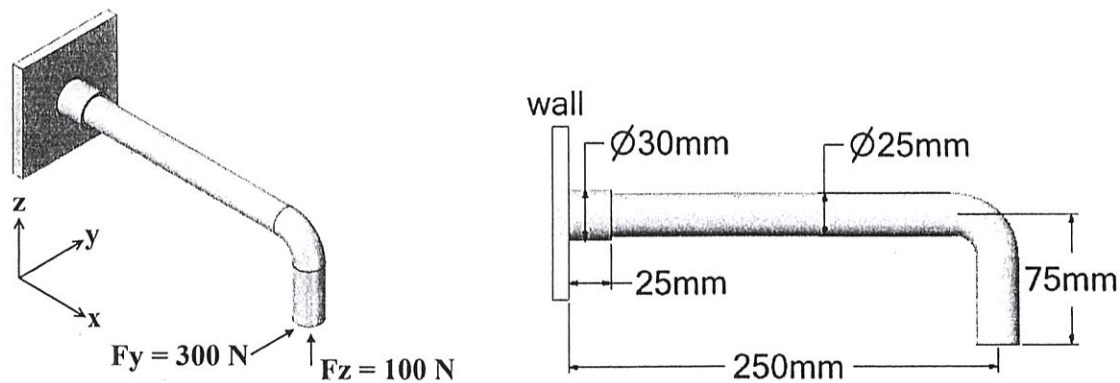
國立臺灣科技大學 104 學年度碩士班招生試題

系所組別：機械工程系碩士班甲組

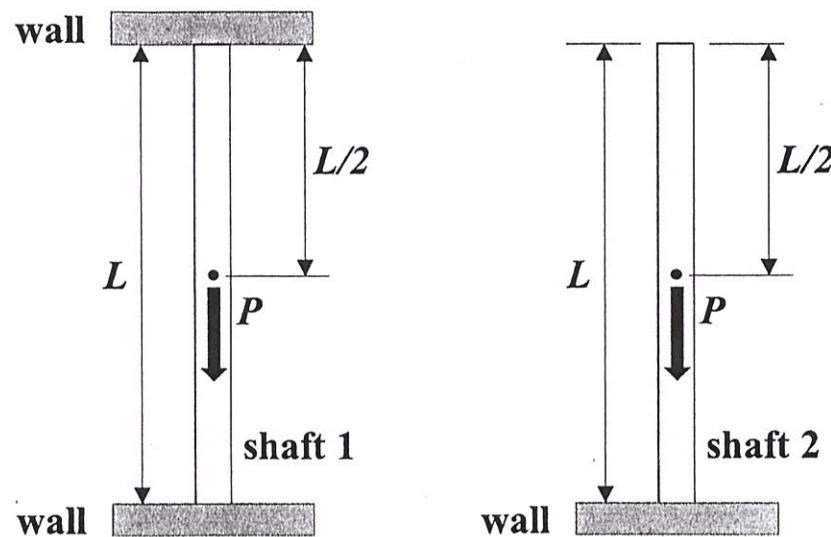
科 目：材力與動力

(總分為 100 分)

1. A solid shaft with a bend is subjected to forces as shown in the figure on the left. The dimensions of the shaft are shown in the figure on the right. Find the maximum principal stress in the shaft in the unit of MPa. Note that the shear stress due to the shear force can be ignored. Do not consider the stress concentration effects. (25%)



2. What is the ratio of the stiffness of shaft 1 to the stiffness of shaft 2? Assuming the forces P can only act at the midpoints of the shafts. Both shafts have the same cross-sectional area A , length L and Young's modulus E . (25%)

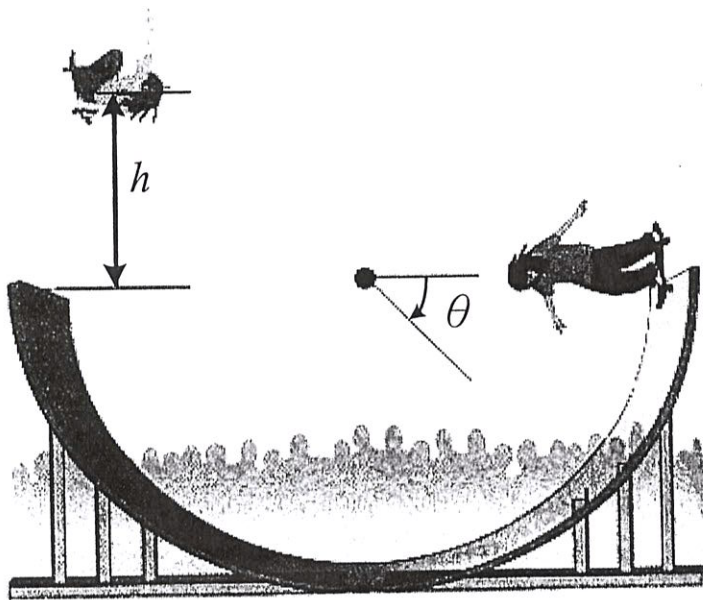


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3. A 70-kg skateboarder starts from rest when $\theta = 0^\circ$ shown the figure, at the top of the circular track with 5-m radius. When $\theta = 45^\circ$, (a) determine the magnitude of the normal force exerted on the skateboarder at the bottom of the circular arc. (15%) (b) If the skateboarder does not start from rest, what is the initial velocity when he wants to reach the height $h = 1\text{ m}$ (10%). Neglect the size of skateboarder and the resistance the surface. (本題共 25%)



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4. As shown the figure, a shaft rotates with a constant angular velocity $\omega = 15$ rad/s. A slender rod is pinned at A to a vertical shaft DE , and its length AB is $L = 3$ m and its mass $m = 20$ kg. The rod is maintained in position by a horizontal wire BC attached to the shaft and to the end B of the rod with $\theta = 60^\circ$. Determine the tension in the wire (15%) and the reaction at A (10%). Note that the moment of inertia about its center of mass is $mL^2/12$ for a uniform slender rod. (本題共 25%)

