國立臺北科技大學

九十四學年度自動化科技研究所入學考試

工程力學試題

填准考證號碼

注意事項：

1. 本試題共五題，每題二十分，共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Determine the damping ratio ζ of the system depicted in Figure 1. The mass and friction of the pulleys are negligible, and the cable remains tight at all times. (***20%***)

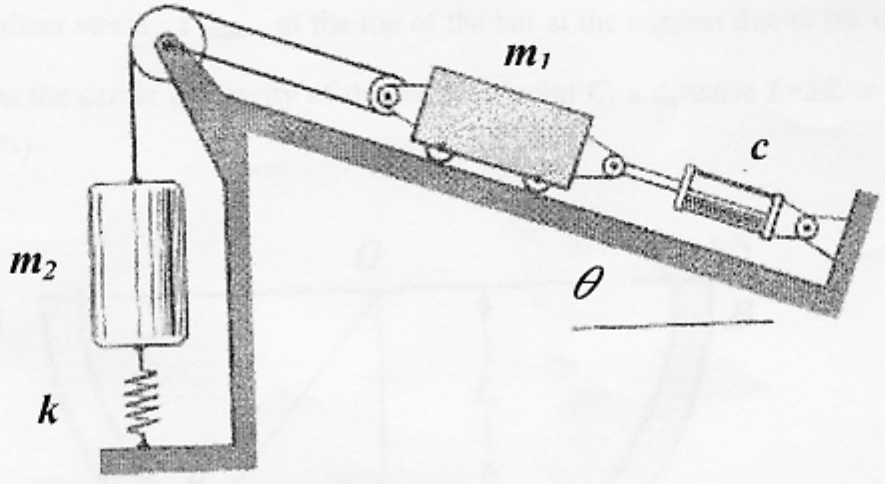

Figure 1

2. Shown in Figure 2, the solid right-circular cone of base radius r and height h rolls on a flat surface without slipping. The center B of the circular base moves in a circular path around the z-axis with a constant speed v. Determine the angular velocity ω and the angular acceleration α of the solid cone. (*20%*)

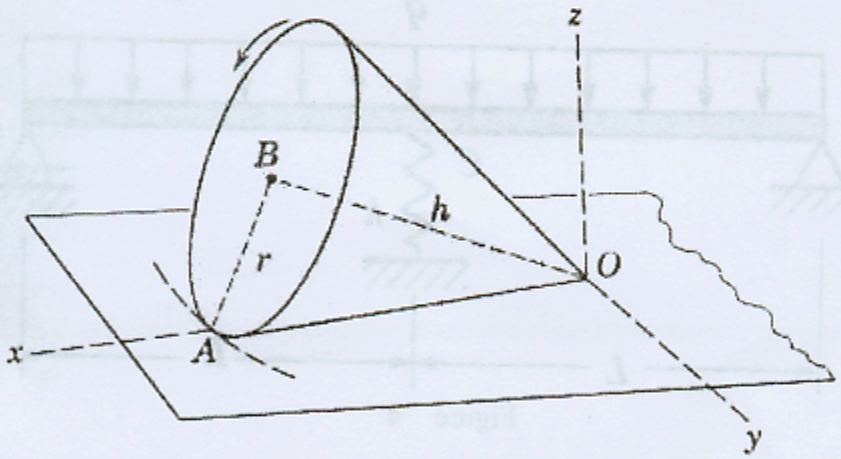

Figure 2

3. The slender rod of mass m and length L is released from rest when it is in the vertical position, shown as Figure 3. If it falls and strikes the soft ledge at A without rebounding, determine the impulse which the ledge exerts on the rod. (*20%*)

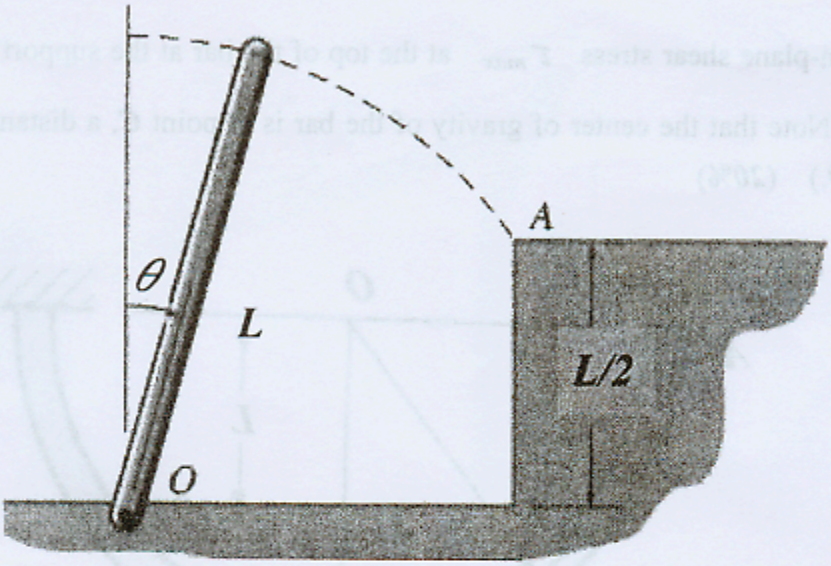

Figure 3

注意：背面尚有試題

4. The beam ***ACB*** is simply supported at ***A*** and ***B*** and supported on a spring of stiffness ***k*** (force per unit of shortening or deformation) at the midpoint ***C***, shown in Figure 4. What should be the stiffness ***k*** of the spring in order that the maximum bending moment in the beam (due to the uniform load ***q*** per unit of length) will have the smallest possible value? (*20%*)

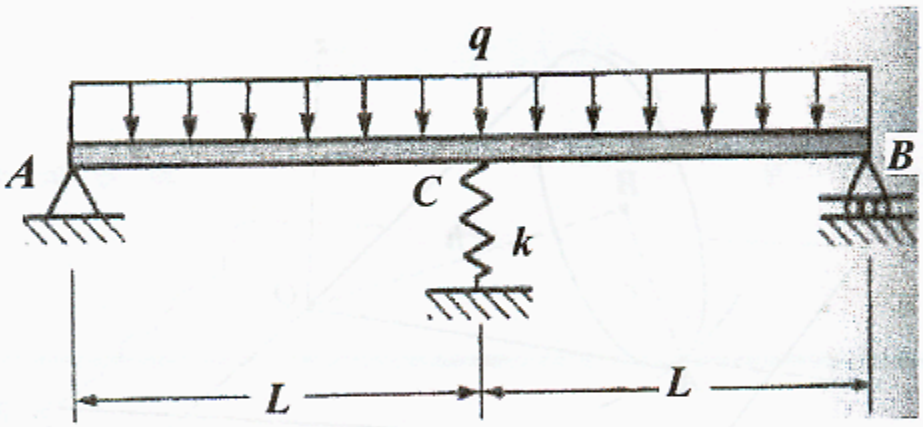

Figure 4

5. A semicircular bar ***AB*** lying in a horizontal plane is supported at ***B*** (refer to Figure 5). The bar has centerline radius ***R*** and weight ***q*** per unit of length (total weight of the bar equals to $\pi q R$). The cross section of the bar is circular with diameter ***d***. Please derive the formulas for the maximum tensile stress σ_t, maximum compressive stress σ_c, and maximum in-plane shear stress τ_{max} at the top of the bar at the support due to the weight of the bar. (Note that the center of gravity of the bar is at point ***C***, a distance $L=2R/\pi$ from the center ***O***.) (*20%*)

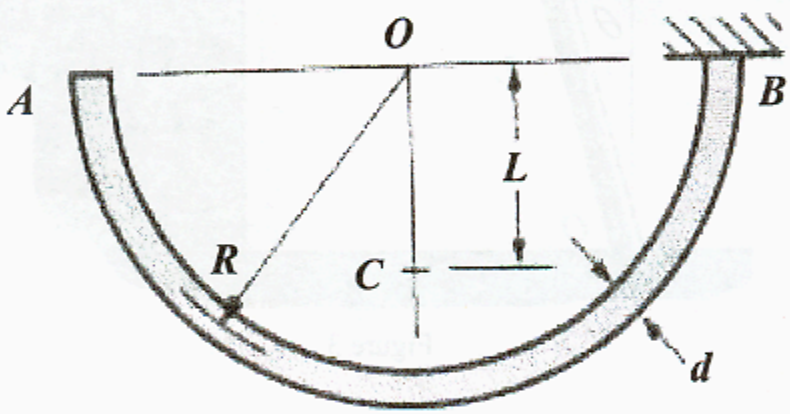

Figure 5