

國立台灣科技大學九十九學年度碩士班招生試題

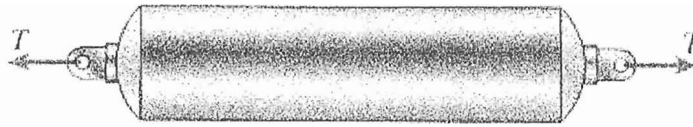
系所組別：機械工程系碩士班甲組

科 目：材力與動力

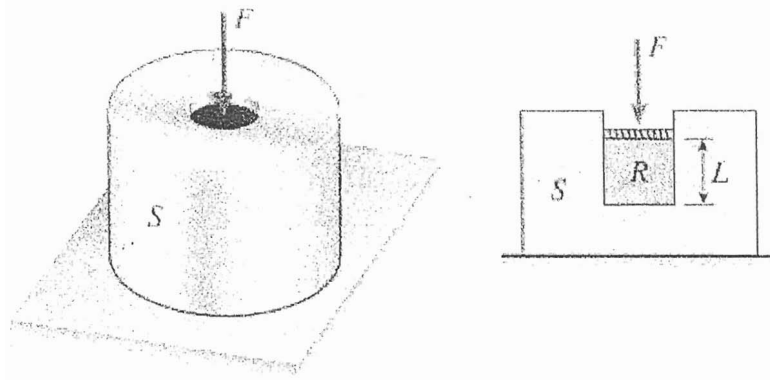
(總分為100分)

總分為100分，每題皆為25分。

1. A cylindrical tank having diameter $d = 60\text{mm}$ is subjected to internal gas pressure $p = 4\text{MPa}$ and an external tensile load $T = 4.5\text{KN}$ (see figure). Determine the minimum thickness t of the wall of the tank based upon an allowable shear stress of 20MPa .



2. A rubber cylinder R of length L and cross-sectional area A is compressed inside a steel cylinder S by a force F that applies a uniformly distributed pressure to the rubber (see figure). The Young's modulus and Poisson's ratio of the rubber are E and ν , respectively. (a) Derive a formula for the lateral pressure p between the rubber and the steel. (Disregard friction between the rubber and the steel, and assume that the steel cylinder is rigid when compared to the rubber.) (b) Derive a formula for the shortening δ of the rubber cylinder.



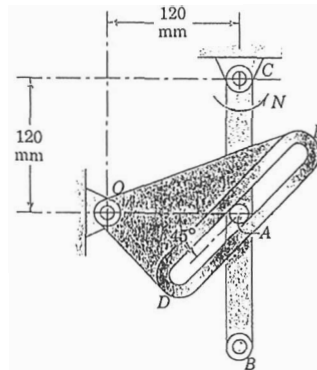
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3. For the instant represented, link CB is rotating counterclockwise at a constant rate $N = 4 \text{ rad/s}$, and its pin A causes a clockwise rotation of the slotted member ODE. Determine the angular velocity ω and angular acceleration α of ODE for this instant.



4. Each of the two uniform bar OA and BC has a mass of 8 kg. The bars are welded at A to form a T-shaped member and are rotating freely about a horizontal axis through O. If the bars have an angular velocity ω of 4 rad/s as OA passes the horizontal position shown, calculate the total force R supported by the bearing at O.

