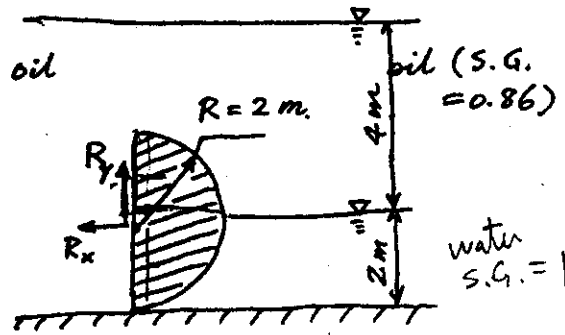系所組別： 水利及海洋工程學系甲、乙組

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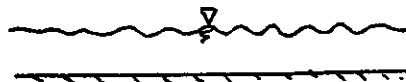
※ 考生請注意：本試題 ☑可　□不可　使用計算機

1. Find the horizontal and vertical forces, R_x and R_y, needed to hold the 10-m-long log in position as shown. (20 pts.)

2. A 100 mm diameter and 200 mm long metal cylinder falls concentrically in a 102 mm diameter vertical pipe filled with oil. The dynamic viscosity of oil is 0.25 Ns/m^2. Determine the terminal (steady state) velocity of the cylinder. The density of oil is 880 kg/m^3. The density of cylinder is 8900 kg/m^3. (20 pts.)
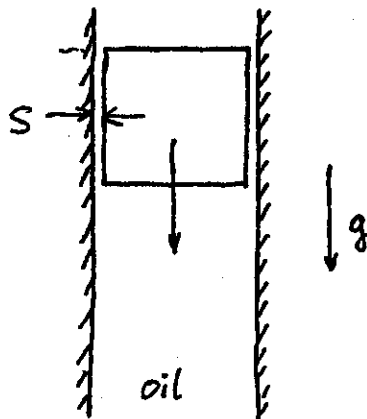

3. A 10:1 laboratory model (model scale is 10 times prototype) is used to study capillary waves in thin water films at 20^0 C and standard atmospheric pressure. Oil (S.G. =0.8) is to be used in the model. Both Froude number and Weber number are important for the simulation. Determine the value of surface tension of the used laboratory oil to insure dynamic similitude. The surface tension of water is assumed to be 0.073 N/m^2. (20 pts.)

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4. Water strikes a block seated on a cart, causing the cart to move at a constant speed. Water is deflected 180^0 by the block. The flow rate of the water is 1 kg/s, and the water velocity is 10 m/s. If the cart is moving at one-half that speed, i.e. $V_{cart} = 5$ m/s, determine the magnitude of the power driving the cart. What is the speed of water exiting the block? (20 pts.)
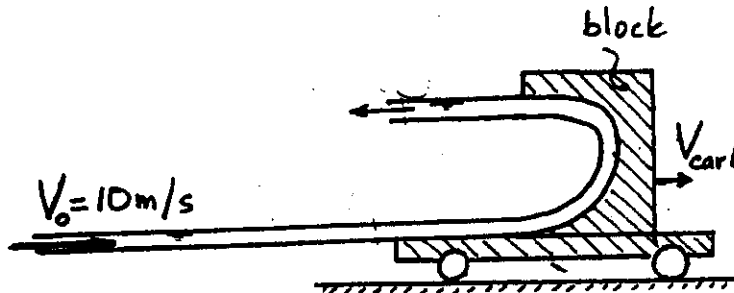
5. Water flows from a two-dimensional open channel and is diverted by an inclined plate. When the velocity in sections (1) and (3) is 10 ft/s, what HORIZONTAL force per unit width is required to hold the plate in position? Neglect friction. (20 Pts)