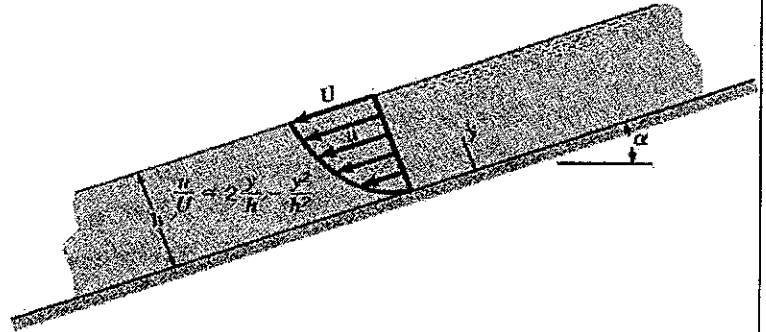
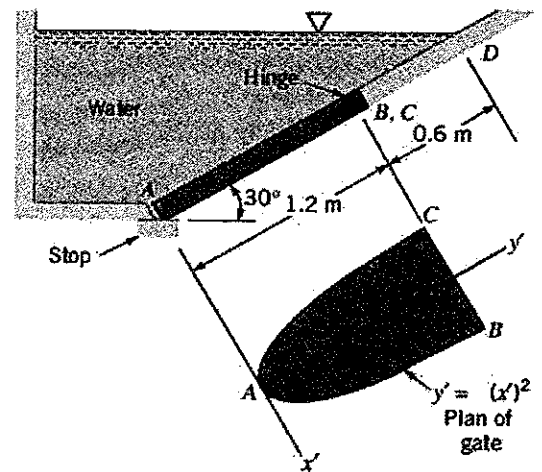


※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

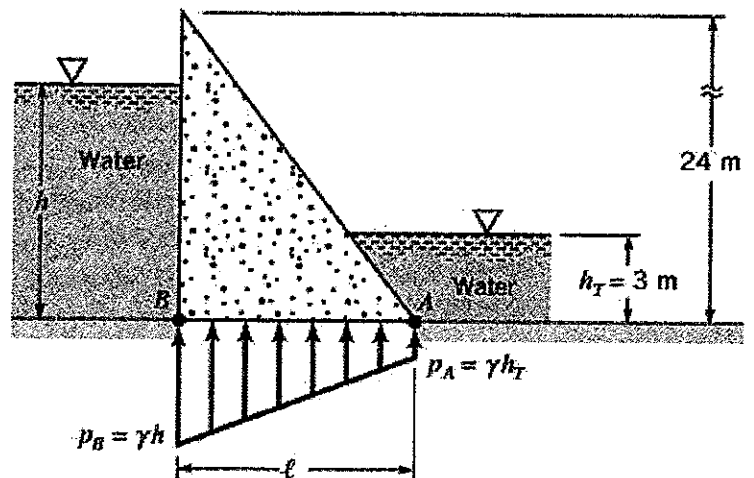
1. A thin layer of glycerin flows down an inclined, wide plate with velocity distribution show below. Please determine the surface velocity (U). Note that for equilibrium, the component of weight acting parallel to the plate surface must be balanced by the shearing force developed along the plate surface. In your analysis assume a unit plate width. (Specific weight and absolute viscosity of glycerin = γ (kN/m^3) and μ ($\text{N}\cdot\text{s/m}^2$), respectively) (20%)



2. The inclined face AD of the tank of flowing figure is a plane surface containing a gate ABC, which is hinged along line BC. The shape of the gate is shown in the plane view. If the tank contains water, determine the magnitude of the force that the water exerts on the gate. (20%)



3. Water (specific weight of water = γ (kN/m^3)) backs up behind a concrete dam as shown below. Leakage under the foundation gives a pressure distribution under the dam as indicated. If the dimension given, derive the relationship between the maximum water depth (h) and width of the dam (ℓ). Base your analysis on a unit length of the dam. The specific weight of the concrete is γ_c (kN/m^3). (20%)



4. A tank initially contains 1000 kg of brine containing 10% salt by mass. An inlet stream of brine containing 10% salt by mass flows into the tank at a rate of 20 kg/min. The mixture in the tank is kept uniform by stirring. Brine is removed from the tank via an outlet pipe at a rate of 10 kg/min. Calculate the amount of salt (S) in the tank at any time (t). (20%)

5. Exhaust ($\rho_{air} \text{ kg/m}^3$) leaves the chimney (diameter= D (in m)) shown below with a speed of V_1 m/s. Because of the wind, after a few diameter downstream the exhaust flows in a horizontal direction with the speed of the wind, V_2 m/s. Determine the horizontal component of the force that the blowing wind exerts on the exhaust gases. (20%)

