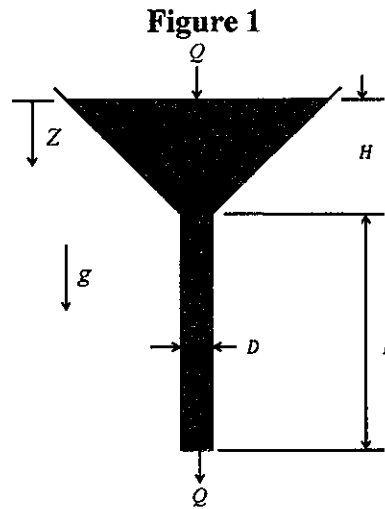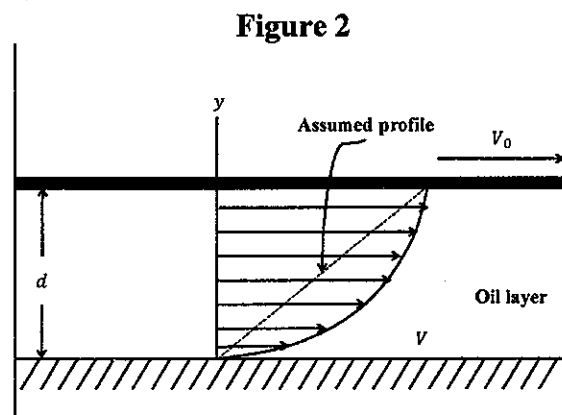※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20 pts) The kinematic viscosity of a mixture of waste oils is to be measured by use of a laboratory funnel. The oil is poured into the funnel at a steady rate Q, as shown in Figure 1, maintaining the level of oil in the funnel at a distance $H = 3$ cm above the entrance to the funnel tube, which has a length $L = 30$ cm and diameter $D = 3$ mm. The time required for 100 cm^3 to pass through the funnel is measured to be 152 s. Calculate the kinematic viscosity υ of the oil mixture (Assume that the flow in the top part of the funnel is inviscid so that the pressure at the entrance to the funnel tube is the same as that at the liquid surface). (Hint: Poiseuille's law)
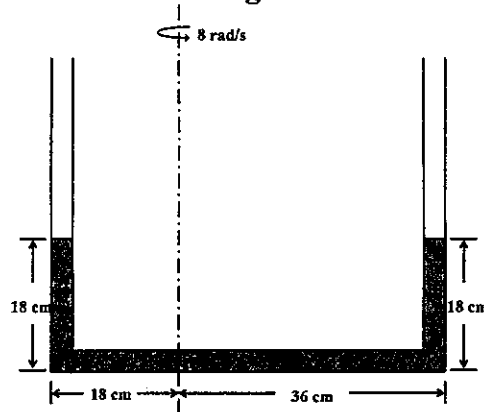
Figure 1

2. (20 pts) A larger plate moves with speed V_0 over a stationary plate on a layer of oil. If the velocity profile is that of a parabola, with the oil at the plates having the same velocity as the plates (see Figure 2), what is the shear stress on the moving plate from the oil? If a linear profile is assumed, what is then the shear stress on the upper plate?

Figure 2

3. (20 pts) Determine the dimensions in the FLT system for (a) Power (b) Modulus of elasticity (c) Specific weight (d) Moment of a force (e) Viscosity?

4. (20 pts) When the U-tube is not rotated, the water stands in the tube as shown in Figure 3.　If the tube is rotated about the eccentric axis at a rate of 8 rad/sec, what are the new levels of water in the tube?

Figure 3

5. (20 pts) Determine the resultant force F_R and its y coordinate y_R (from axis O_2) due to water acting on the 4 m by 6 m triangle area CD shown in Figure 4.　The apex of the triangle is at C.

Figure 4