

※ 考生請注意：本試題 可 不可 使用計算機

1. A water stream is draining from a circular hole on the flat bottom of a container, the stream sectional radius contracts as the flow velocity increased. Assume the stream starts with velocity zero and tank water level of H height, find the distance below the hole where the stream tube sectional radius is 80% of the hole radius. (20%)

2. An air bubble of volume 20cm^3 rises from the bottom of a lake 30m deep. The temperature at the bottom is 4°C . The bubble rises to the surface which is 20°C and at atmospheric pressure. Assume the bubble is in thermal equilibrium with the surrounding at all the times, calculate the volume of the bubble at the surface. (15%)

3. A mass of 2.7 kg is connected to a horizontal spring whose stiffness is 8.5 N/L . When the spring is relaxed, $x = 0$. The spring is stretched so that the initial value of $x = +0.16 \text{ m}$. The mass is released from rest at time $t = 0$. Predict the position x when $t = 1.06 \text{ s}$. (15%)

4. A parachute at height h above the ground is dropped vertically downward with initial speed $V = 0$. Assume the total weight of the parachute plus the payload is W and the drag can be represented by kV^2 where k is constant. Determine the speed $V(h)$ of the parachute when it hits the ground. (25%)

5. In the circuit of the following figure, determine the conditions under which the current through R_5 is zero. (25%)

