國立成功大學

110學年度碩士班招生考試試題

編　號：106

系　所：水利及海洋工程學系

科　目：流體力學

日　期：0203

節　次：第 1 節

備　註：可使用計算機

編號： 106　　國立成功大學 110 學年度碩士班招生考試試題

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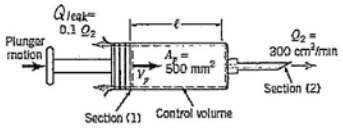
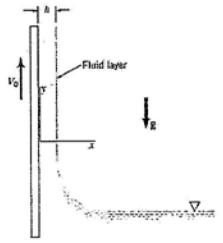
※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

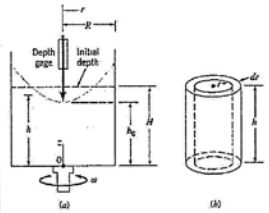
1. The plunger of a syringe has a face area of 500mm^2. If the liquid in the syringe is to be injected steadily at a rate of 300 cm^3/min, at what speed should the plunger be advanced? The leakage rate past the plunger is 0.10 times the volume flowrate out of the needle. (20%)



2. A wide moving belt passes through a container of a viscous liquid. The belt moves vertically upward with a constant velocity, V_o. Because of viscous forces the belt picks up a film of fluid of thickness h. Gravity tends to make the fluid drain down the belt. Use the Navier-Stokes equations to determine an expression for the average velocity of the fluid film as it is dragged up the belt. Assume that the flow is laminar, steady, uniformed, and fully developed. (20%)



3. It has been suggested that the angular velocity, ω, of a rotating body or shaft can be measured by attaching an open cylinder of liquid, and measuring with some type of depth gage the change in the fluid level, H-h_o. Caused by the rotation of the fluid. (1) Determine the relationship between this change in fluid level and the angular velocity. (2) If R=3cm, H=20cm, and h_o=16cm *what is the value of* the angular velocity, ω? *(20%)*



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4. $\vec{V}=(0.8+0.4x)\vec{i}+(1.2-0.4y)\vec{j}$

(1) what is the linear strain rate, shear strain rate, and volumetric strain rate? (10%)

(2) what is the potential function? (5%)

(3) Is this incompressible flow? If yes, what is the stream function? (5%)

5. For a given pipe, the length of the pipe is 40m and the diameter of the pipe is 0.2m. The density of fluid is 1.1683 kg/m^3 and viscosity is 1.918X10^{-5} kg/ms. The friction factor is 0.01833. The flow rate or discharge of the pipe is 0.5 m^3/s (1) determine the Reynolds Number, Is the flow turbulent or laminar? (5%) (2) Estimate the head loss of the pipe using Darcy-Weisbach Equation. (15%)