

淡江大學九十四學年度碩士班招生考試試題

78-1

系別：機械與機電工程學系 科目：流體力學

准帶項目請打「V」	
✓	簡單型計算機

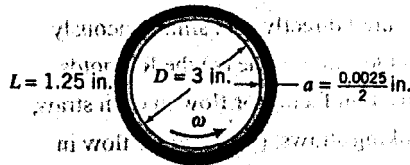
本試題共 1/2 頁

本試題雙面印製

1. Please give definition of: (20%)

- (1) no-slip condition
- (2) wake
- (3) intensive property
- (4) continuum
- (5) uniform flow at a section
- (6) Mach number
- (7) Newtonian fluid
- (8) incompressible flow
- (9) viscosity
- (10) List 4 restrictions for the Bernoulli equation

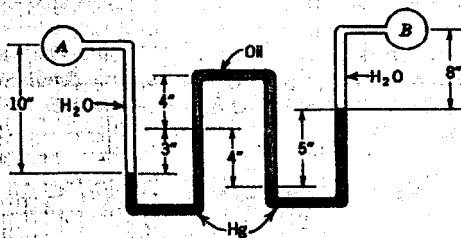
2.



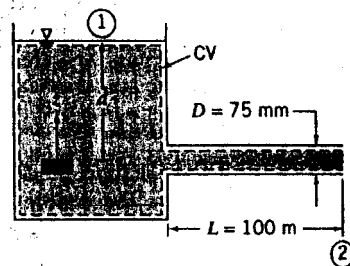
Journal bearing, as shown, Lubricant is oil, speed is 3600rpm.

Assume $\tau_{yx} = \mu \frac{U}{a} = \mu \frac{\omega R}{a}$,
 $\mu = 3 \times 10^{-4} \text{ lbf} \cdot \text{s}/\text{ft}^2$, Please find torque, T (15%)

3. Water flows through pipes A and B. Oil, with specific gravity 0.8, is in the upper portion of the inverted U. Mercury (specific gravity 13.6) is in the bottom of the manometer bends. Determine the pressure difference, $p_A - p_B$. ($g = 32.2 \text{ ft}/\text{sec}^2$, $\rho_{\text{H}_2\text{O}} = 1.94 \text{ slug}/\text{ft}^3$, 1 slug = 1 lbf · sec²/ft) (15%)



4. Water flow at $0.0084 \text{ m}^3/\text{s}$, through the smooth pipe as shown, the inlet is square-edged and water discharges to atmosphere
 assume $P_1 = P_2 = P_{\text{atm}}$, $\vec{V}_1 \cong 0$,
 $\vec{V}_2 = \vec{V}$, kinetic energy coefficient $\alpha_1 = \alpha_2 = 1$,
 $\rho = 999 \text{ kg}/\text{m}^3$, $\mu = 1 \times 10^{-3} \text{ kg}/(\text{m} \cdot \text{s})$, loss coefficient $K \cong 0.5$, use Blasius correlation $f = \frac{0.316}{\text{Re}^{0.25}}$ to calculate friction factor.



what depth, d must be maintained in the reservoir to maintain flow? (20%)

淡江大學九十四學年度碩士班招生考試試題

98-2

系別：機械與機電工程學系

科目：流體力學

准帶項目請打「√」	
✓	簡單型計算機
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5. For a flow in the xy plane, the x component of velocity is given by $u = Ax^2y^2$, where $A = 0.3 \text{ m}^{-3} \text{ s}^{-1}$, and x and y are measured in meters. Find a possible y component for steady, incompressible flow. Is it also valid for unsteady, incompressible flow? Why? How many possible y components are there? Determine the equation of the streamline for the simplest y component of the velocity vector.

Plot stream function in first quadrant. $u = \frac{\partial \psi}{\partial y}$, $v = -\frac{\partial \psi}{\partial x}$ (15%)

6. Drinking straws are to be used to improve the air flow in a pipe-flow experiment. Packing a section of the air pipe with drinking straws to form a "laminar flow element" might allow the air flow rate to be measured directly, and simultaneously would act as a flow straightener. To evaluate this idea, determine (a) the Reynolds number for flow in each drinking straw, (b) the friction factor for flow in each straw, and (c) the gage pressure at the exit from the drinking straws. (For laminar flow in a tube, the exit loss coefficient is $K_t = 1.4$ and $\alpha = 2.0$.) (15%)

