淡江大學八十八學年度碩士班招生考試試題

系別：機械工程學系　　科目：流體力學　　本試題共 2 頁

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1.An inverted *0.1-m-diameter* circular cylinder is partially filled with water and held in place as shown in Fig.1. A force of *20-N* is needed to pull the flat plate from the cylinder. Determine the air pressure (*kPa*) within the cylinder. The plate is not fasten to the cylinder and has negligible mass. (25%)

Note : $\gamma_{H_2O} = 9.80\ KN/m^3$

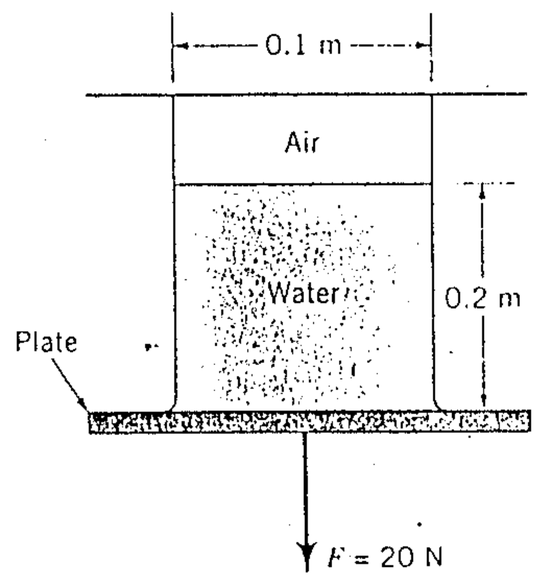

Fig.1

2.Some animals have learned to take advantage of the Bernoulli effect without having read a fluid mechanics book. For example, a typical prairie dog burrow contains two entrances – a flat front door, and a mounded back door as shown in Fig.2. When the wind blows with velocity V_0 across the front door, the average velocity across the back door is greater than V_0 because of the mound. Assume the air velocity across the back door is $1.07\ V_0$. For a wind velocity of *6 m/s*, what pressure difference, $p_1 - p_2$, is generated to provide a fresh air flow within the burrow ? (25%)

Note : 1) Air is assumed to be incompressible.

2) You may negligible gravitational effects.

3) $\rho_{air} = 1.23\ Kg/m^3$

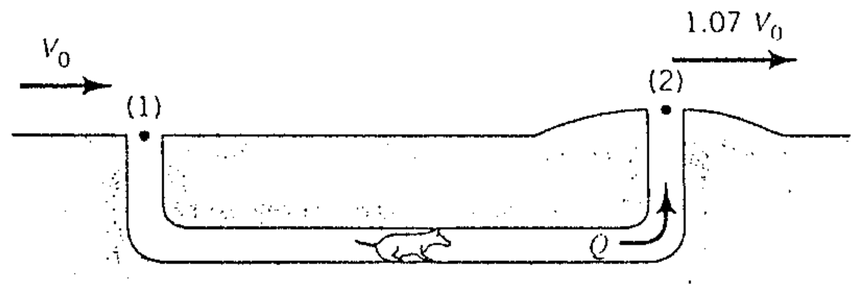

Fig.2

◀注意背面尚有試題▶

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3.A fluid flows past a circular cylinder of radius a with an upstream speed of V_o as shown in Fig.3. A more advanced theory indicates that if viscous effects are negligible, the velocity of the fluid along the surface of the cylinder is given by $V=2V_o \sin\theta$. Determine the streamline and normal components of acceleration on the surface of the cylinder as a function of $2V_o$, a, and θ. (25%)

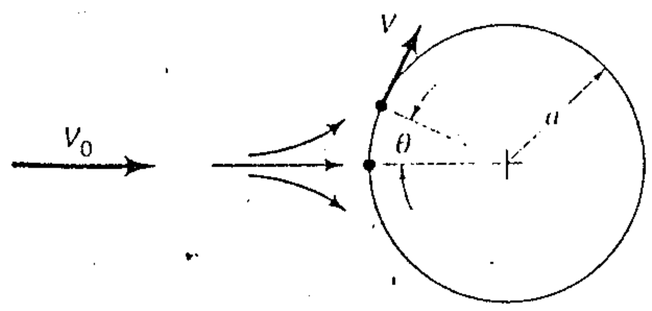

Fig.3

4.A vane directs a horizontal, circular cross-sectional jet of water symmetrically as indicated in Fig.4. The Jet leaves the nozzle with a velocity of *100 ft/s*. Determine the x direction component of anchoring force required to confine the speed of the vane to a value of *10 ft/s* to the right. The fluid speed magnitude remains constant along the vane surface. (25%)

Note : $\gamma_{H_2O} = 62.4\, lb/ft^3$

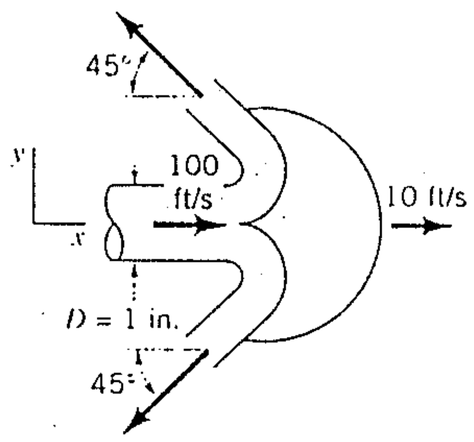

Fig.4

◀注意背面尚有試題▶