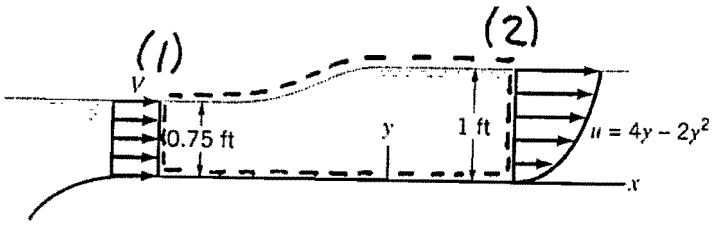
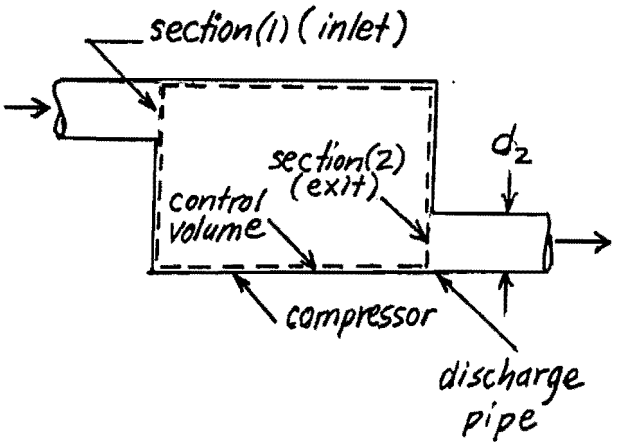
國立雲林科技大學
101 學年度碩士班暨碩士在職專班招生考試試題

系所：機械系
科目：流體力學(1)

1. As shown in the following figure, at the entrance to a 3-feet-wide channel the velocity distribution is uniform with a velocity V. Further downstream the velocity is given by $u=4y-2y^2$, where u is in ft/s and y is in feet. Determine the value of V. 25%



2. Air at standard atmospheric conditions is drawn into a compressor at the steady rate of $30m^3/sec$. The compressor pressure ratio, P_{exit}/P_{inlet}, is 10 to 1. Through the compressor P/ρ^n remains constant with n=1.4. If the average velocity in the compressor discharge pipe is not to exceed 30 m/s, calculate the minimum discharge pipe diameter required. 25%



國立雲林科技大學
101 學年度碩士班暨碩士在職專班招生考試試題

系所：機械系
科目：流體力學(I)

3. The manometer shown contains water at room temperature and is opened to the atmosphere. Tha glass tube on the left has an inside diameter of 1mm (d = 1mm). The glass tube on the right is three times as large. (25%)

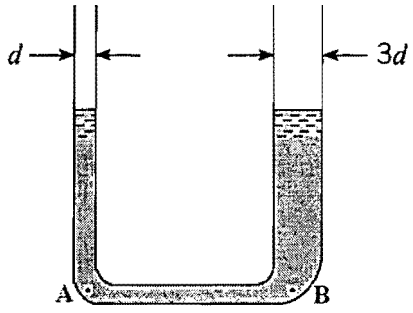
a) Is water surface level in the left tube higher than, equal to, or lower than the water surface level in the right tube? Why?

b) When considering the effect of surface tension, will the answer above change? Why?

c) If the top of the left tube is sealed and the air gauge pressure inside is 0.01atm, then which side has higher water surface level? Why?

d) If the manometer moves at a constant velocity to the right, which point will have a higher pressure? A or B? Why? (A and B are at the bottom of the left and right tube respectively)

e) If the manometer is now accelerated at a constant rate to the right, then which point will have a higher pressure? Why?



4. Water flows steadily through a horizontal circular pipe, (25%)

a) Draw the time-averaged velocity profile for flow under laminar and turbulent condition.

b) Draw the shear stress distribution across the pipe's diameter, i.e., shear stress(τ) vs. radial position(r).

c) Describe the relationship between the pressure drop through the pipe and the pipe length. (use words such as proportional, inversely proportional, linear, non-linear, to the power of 2, etc.)

d) Describe the relationship between the pressure drop through the pipe and the pipe diameter with the mass flow rate and friction factor staying the same.

e) Describe the relationship between the pressure drop through the pipe and the averaged velocity inside the pipe.