

國立嘉義大學九十三年學年度 土木與水資源工程學系碩士班招生考試試題

科目：流體力學

注意：1.本試題不可使用計算機

2.本試題如條件不足，請自行假設

1. The velocity field of a flow is given by $V = 20y/(x^2 + y^2)^{1/2} \mathbf{i} - 20x/(x^2 + y^2)^{1/2} \mathbf{j}$ ft/s where x and y are in feet. Determine the fluid speed at points along the x axis; along the y axis. What is the angle between the velocity vector and the x axis at point $(x, y) = (5,0)$, $(5,5)$, $(0,5)$? (15%)
2. A gas flows along the x -axis with a speed of $V = 5x$ m/s and a pressure of $p = 10x^2$ N/m², where x is in meters.
 - (a) Determine the time rate of change of pressure at the fixed location $x = 1$. (8%)
 - (b) Determine the time rate of change of pressure for a fluid particle flowing past $x = 1$. (7%)
3. Determine the flowrate through the Venturi meter show in Fig. 1 if ideal conditions exist. (20%)
4. An open 1-m-diameter tank contains water at a depth of 0.5 m when at rest. As the tank rotated about its vertical axis the center of the fluid surface is depressed. At what angular velocity will the bottom of the tank first be exposed? No water is spilled from the tank. (15%)
5. A 5-m-wide rectangular channel is carrying a flow of 5 cms. If the Manning $n=0.013$ and the bottom slope, $S_0=0.001$, determine the normal depth and the critical depth. (20%)
6. What pressure gradient along the streamline, dp/ds , is required to accelerate water upward in a vertical pipe at a rate of 10 m/s^2 ? (15%)

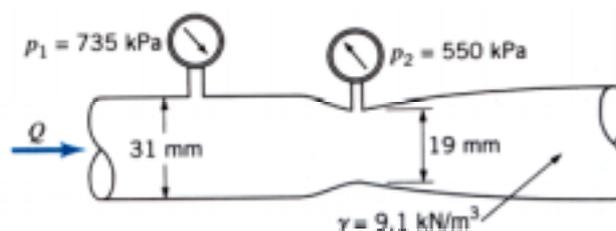


Fig. 1