

- 5.40** Assume ideal fluid. The pressure at section 1 in the Fig. P5.40 is 10 psi, $V_1 = 15$ fps, $V_2 = 50$ fps, and $\gamma = 60$ lb/ft³. (a) Determine the reading on the manometer. (b) If the downstream piezometer were replaced with a pitot tube, what would be the manometer reading? Comment on the practicality of these arrangements.

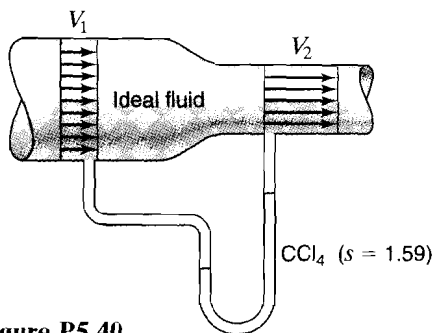


Figure P5.40

- 5.41** Refer to Fig. P5.40. Assume an ideal fluid with $\rho = 900$ kg/m³. The pressure at section 1 is 100 kN/m², $V_1 = 10$ m/s, $V_2 = 20$ m/s. (a) Determine the reading on the manometer. (b) If the downstream piezometer were replaced with a pitot tube, what would be the manometer reading? Comment on the practicality of these arrangements.
- 5.42** By manipulation of Eq. (5.44), demonstrate that it represents a standard parabola of the form $z - z_0 = a(x - x_0)^2$, where a is a constant and x_0 and z_0 are the coordinates of the vertex.
- 5.43** Find the maximum ideal horizontal range of a jet having an initial velocity of 90 fps. At what angle of inclination is this obtained?
- 5.44** Repeat Exer. 5.16.1. Let $V = Q/A = 24$ fps, but assume a parabolic velocity profile.
- 5.45** Using Fig. X5.16.1, which depicts a two-dimensional flow in a vertical plane, find the pressure at B if the pressure at A is 32 kPa. Data are as follows: $r = 3$ m, $b = 1.2$ m, $\gamma = 9.81$ kN/m³, $V = Q/A = 5$ m/s. Assume a parabolic velocity profile.
- 5.46** In Fig. P5.46 the rotor vanes are all straight and radial, $r_1 = 0.3$ ft, $r_2 = 0.9$ ft, and the height perpendicular to the plane of the

figure is constant at $B = 0.25$ ft. Then $A = 2\pi rB$. If the rotation speed is 1000 rpm and the flow of liquid is 9.6 cfs, find the difference in the pressure head between the outer and the inner circumferences, neglecting friction losses. Does it make any difference whether the flow is outward or inward?

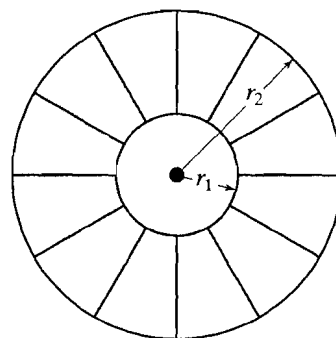


Figure P5.46

- 5.47** In Fig. P5.46 the vanes are all straight and radial, $r_1 = 10$ cm, $r_2 = 20$ cm, and the height perpendicular to the plane of the figure is constant at $B = 80$ mm. Then $A = 2\pi rB$. If the rotation speed is 1000 rpm and the flow of liquid is 0.3 m³/s, find the difference in the pressure head between the outer and the inner circumferences, neglecting friction losses. Does it make any difference whether the flow is outward or inward?
- 5.48** An air duct of 2.5 ft by 2.5 ft square cross section turns a bend of radius 5 ft as measured to the centerline of the duct. If the measured pressure difference between the inside and outside walls of the bend is 1.5 in of water, estimate the rate of air flow in the duct. Assume standard sea-level conditions in the duct and assume ideal flow around the bend.
- 5.49** An air duct of 1.2 m by 1.2 m square cross section turns a bend of radius 2.4 m as measured to the centerline of the duct. If the measured pressure difference between the inside and outside walls of the bend is 50 mm of water, estimate the rate of air flow in the duct. Assume standard sea-level conditions in the duct and assume ideal flow around the bend.