MEAN 144/200
SD 36/200

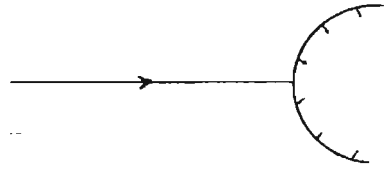
Full credit for correct final answer with coherent argument -otherwise partial credit as show

ME106 Fluid mechanics
2nd Test, S04

NAME SOLUTIONS

MEAN 52
SD 14

1. (65) Air at temperature $T_\infty = 293$ K and pressure $p_a = 101$ kPa flows at speed $V_\infty = 500$ m/s towards the stagnation point S. The specific heat ratio $\gamma = 1.4$, and the gas constant $R = 287$ J/kg·K. Find:



(a) the stagnation temperature T_o;

(b) the stagnation pressure p_o; and

(c) the pressure p_s at the stagnation point.

PLEASE PRINT YOUR NAME ON THIS PAGE

SP042-1 = 0.946

* DO NOT DO PART (c) *

MEAN 40 SD 19

2. (65) The large tank contains compressed air at pressure $p_o = 400$ kPa and temperature $T_o = 293$ K. (Relevant properties for air are given in problem 1.) Find the horizontal component of force needed to hold the tank stationary if the air leaves to atmospheric pressure under the following conditions:

(a) through a converging nozzle with exit diameter 10 mm; and

(b) through a converging–diverging nozzle chosen so the exit pressure is atmospheric.

(c) For part (b), find the exit area of the nozzle.

MEAN 52
SD 18

3. (70) A jet of water flows over the fixed cone and leaves as a conical sheet. The flow is incompressible and inviscid, and gravity is negligible. Using mass and momentum balances, and Bernoulli's equation, find the force F needed to hold the cone stationary in terms of the diameter d, density ρ, jet speed V and cone angle θ.