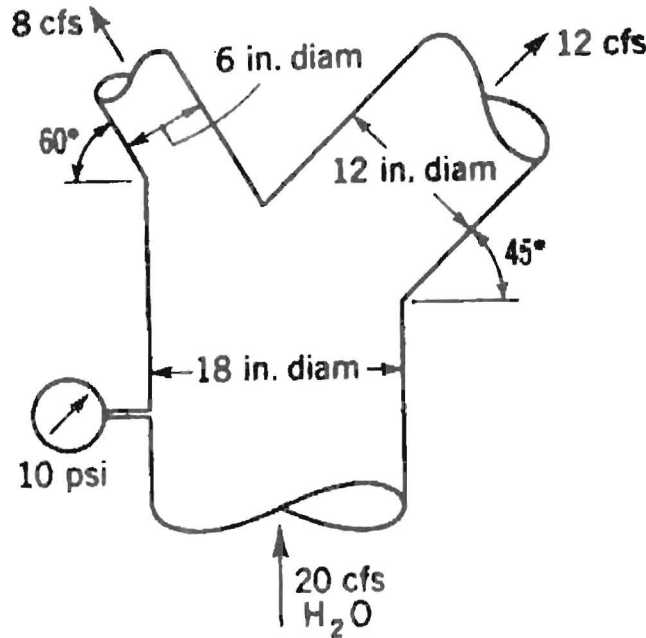※ 考生請注意：本試題 ☑可 □不可 使用計算機

1. Neglecting losses, determine the x and y components of force needed to hold the Y (Figure 1) in place. The plane of the Y is horizontal. (20%)

x is positive in the right direction.

y is positive in the upward direction.

Figure 1　The x and y components of force

2. Two cubes of same size, 8 m^3, one of specific gravity $S = 0.84$ and the other of $S = 1.15$, are connected by a short wire and placed in water. What portion of the lighter cube is above the water surface, and what is the tension in the wire? (20%)

3. At section 1 of a canal the cross section is trapezoidal, $b_1 = 13$ m, $m_1 = 2$, $y_1 = 15$ m, and at section 2, downstream 430 m, the bottom is 0.09 m higher than at section 1,　$b_2 = 23$ m, and $m_2 = 2.5$, $Q = 980$ m^3/s, $n = 0.031$.

Determine the depth of water at section 2.　　(20%).

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4. A circular pipe with a inner diameter of 2 meter, a total water flow rate of 9 m^3/sec and a manning roughness factor of 0.018, please calculate the following items:

　(1). the water depth at the best hydraulic cross section (15%);
　(2). the average velocity at the best hydraulic cross section (5%).

5. Please explain the following items:
　(1). Laminar flow and Turbulent Flow (4%);
　(2). Internal Flow and External Flow (4%);
　(3). Tranquil Flow and Rapid Flow (4%);
　(4). Reynolds Number and Froude Number (4%);
　(5). Dimensional Homogeneity and Dimensional Analysis (4%)