

國立中山大學 102 學年度碩士暨碩士專班招生考試試題

科目名稱：流體力學【環工所碩士班甲組】

題號：433002

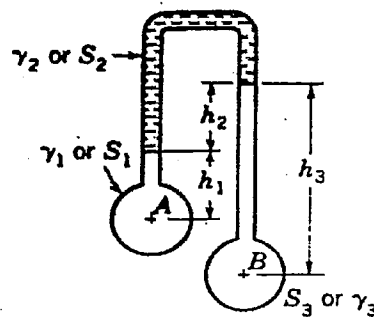
※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）

共 2 頁第 1 頁

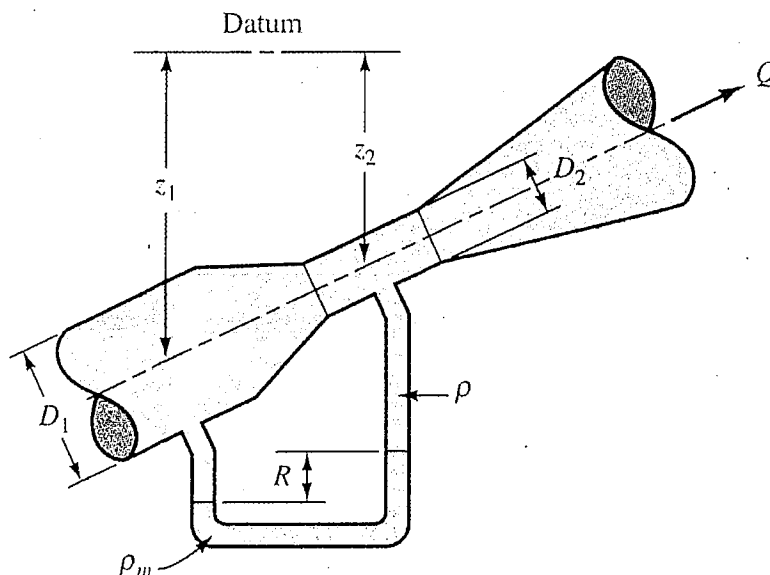
考生不得於試題紙上作答

1. The liquids at A and B in the figure below are water with specific weight $S_1 = S_3 = 1.0$. The manometer liquid is oil with specific weight $S_2 = 0.80$. Given that $h_1 = 250$ mm, $h_2 = 200$ mm, and $h_3 = 550$ mm, then determine:

- (a) the pressure difference, $P_a - P_b$, in pascals. (10%)
- (b) the pressure at point A in meters of water absolute if $P_b = 60$ kPa and the barometer reading is 740 mmHg. (10%)



2. Water is flowing in an open channel at a depth of 3 m and a velocity of 2ms^{-1} . Then it flows down a contracting chute into another channel, with the depth and the velocity being 1 m and 12ms^{-1} , respectively. Assume frictionless flow, and then determine the difference in elevation of the channel floors. (15%)
3. Derive an expression relating the volume rate of flow Q with the manometer readings of R , ρ_m , ρ , D_1 , D_2 , and g (gravity acceleration), as shown below. (15%)



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4. A two-dimensional steady velocity field (u, v) in the (x, y) plane is given by:

$$u = x^2 - y^2, \quad v = -2xy$$

Derive the equation of streamline (18%).

5. 當邊界層(boundary layer)發生剝離(separation)時，流線方向上的壓力梯度以及下游處的流場通常會發生何種現象？簡述之。(12%)

6. 下圖為由三個支管並聯組成的管路系統，圖中箭頭表示液體流動的方向。若 Q_1 、 Q_2 、 Q_3 分別為支管(1)、(2)、(3)的流量，而 Δh_1 、 Δh_2 、 Δh_3 分別為對應的壓頭損(head loss)，則：

- (a) 於 B 點的流量為何？(10%)
(b) 於 A、B 兩點間的壓頭損為何？(10%)

