1. 請用公式定義以下名詞，並描述物理意義 *(25 分)*
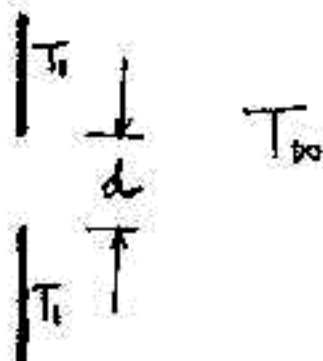   (a) Blackbody
    (b) Nusselt number
    (c) Reynolds number
    (d) Prandtl number
    (e) Raleigh number

2. 平行水平板間層流流場若為 Thermally & hydraulically fully developed 一面板 $\dot{q}_w = const$，一面板絕緣，求導兩片板各自之 Nusselt number
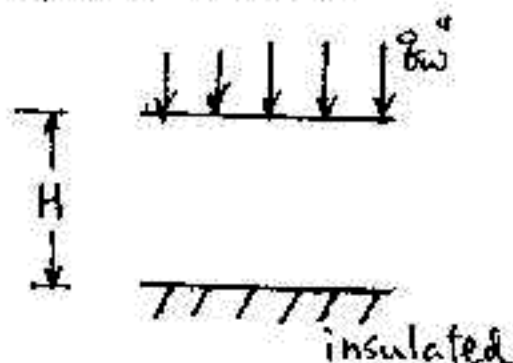

(30 分)

3. 兩塊平板（如圖）之間的距離為 d，兩板的溫度皆為 T_1，放在室溫為 T_∞ $(T_1 > T_\infty)$ 的環境中，請問距離 d 對熱傳的影響，為什麼？ *(20 分)*

4. A thermocouple junction, which may be approximated as a sphere, is to be used for temperature measurement in a gas stream. The convection coefficient between the junction surface and the gas is know to be $h = 400$ W/in^2 · K, and the junction thermophysical preperties are $k = 20$ W/in · K, $c = 400$ J/kg · K, and $p = 8500$ kg/m^3. Determine the junction diameter needed for the thermocouple to have a time constant of 1 s. If the junction is at 25 ℃ and is placed in a gas stream that is at 200℃, how long will it take for the junction to reach 199℃ ?　　　　*(15 分)*
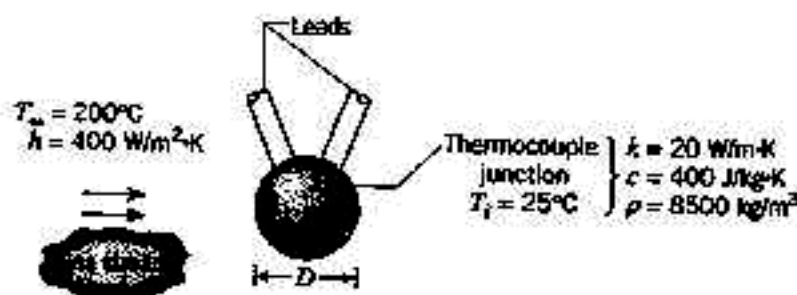
5. A square silicon chip (k = 150 W/in · K) is of width w = 5 mm on a side and of thickness t = 1 mm. The chip is mounted in a substrate such that its side and back surfaces are insulated, while the front surface is exposed to a coolant.
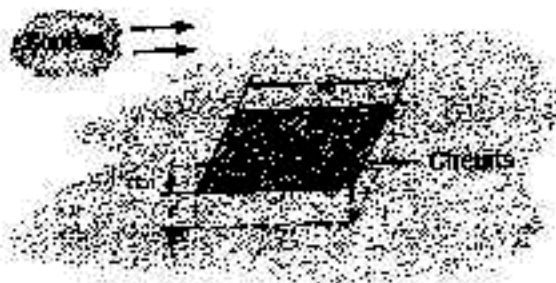
If 4 W are being dissipated in circuits mounted to the back surface of the chip, what is the steady-state temperature difference between back and front surface ?　　　　*(10 分)*