

# 國立臺北科技大學九十五學年度碩士班招生考試

系所組別：1203 製造科技研究所不分組

## 第二節 熱力學 (選考) 試題

填准考證號碼

第一頁 共一頁

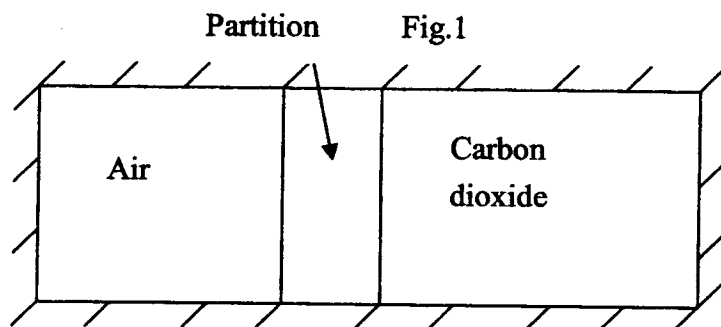
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### 注意事項：

1. 本試題共三題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

### Problem 1. (30%)

Two kilogram of air, initially at 6 bars, 300K, and 3 kg of carbon dioxide, initially at 2 bars, 400K, are confined to opposite sides of a rigid, well-insulated container, as illustrated in Fig. 1. The partition is free to move and allows conduction from one gas to the other without energy storage in the partition itself. The air and carbon dioxide each behave as ideal gases. Determine the final equilibrium temperature, in K, and the pressure, in bars, assuming cold air standard method.



### Problem 2. (30%)

Engineers want to modify traditional compressor and find minimum compressor's work to compress air from lower pressure  $P_1$  to higher pressure  $P_2$ .

- a) What is the required thermal device need to be bought? Please by plot the p-v diagram and connect the device with compressor.
- b) What is the saving compressor work? Please by formula representation.

**Problem 3. (40%)**

Please prove or interpret the following

a) (10%)  $\frac{dp}{dT} = \frac{h_{fg}}{Tv_{fg}}$  for phase change

b) (10%)  $\frac{C_p}{C_v} = \frac{k_T}{k_S}$  where  $k_T$  isothermal compressibility  
 $k_S$  isentropic compressibility

c) (10%) Please plot Reheat and Regenerate Rankine power Cycle.

d) (10%) Please write down the incomplete combustion of  $C_3H_8$  and Air mixture by equivalence ratio  $\Phi$  and find formula for the adiabatic flame temperature.