

大葉大學 九十四 學年度 研究所碩士班 招生考試試題紙

系 所 別	組 別	考 試 科 目 (中 文 名 稱)	考 試 日 期	節 次	備 註
車輛工程所	甲	內 燃 機	3 月 27 日	第二節 10:30~12:00	共 2 頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1. (24%)

Please explain the function of the following components in detail.

- |                  |                  |
|------------------|------------------|
| (a) Flywheel     | (b) Piston rings |
| (c) Turbocharger | (d) EGR          |
| (e) Water jacket | (f) Throttle     |

2. (36%)

A four-cylinder, 2.5-liter, SI automobile engine operates at WOT on a four-stroke air-standard Otto cycle at 3000 RPM. The engine has a compression ratio of 8.6:1, a mechanical efficiency of 86%, and a stroke-to-bore ratio  $S/B = 1.025$ . Fuel is iso-octane with  $AF = 15$ , a heating value of 44,300 kJ/kg, and combustion efficiency  $\eta_c = 100\%$ . At the start of the compression stroke, conditions in the cylinder combustion chamber are 100 kPa and 60°C. It can be assumed that there is a 4% exhaust residual left over from the previous cycle.

Do a complete thermodynamic analysis of this engine.

3. (20%)

The four-cylinder engine of a light truck owned by a utility company has been converted to run on propane fuel. A dry analysis of the engine exhaust gives the following volumetric percentages:

- |                 |       |
|-----------------|-------|
| CO <sub>2</sub> | 4.90% |
| CO              | 9.79% |
| O <sub>2</sub>  | 2.45% |

Calculate the equivalence ratio at which the engine is operating.

4. (20%)

As the flame front reaches the wall of a combustion chamber, reaction stops due to the closeness of the wall, which dampens out all fluid motion and conducts heat away. This unburned boundary layer can be considered a volume 0.1 mm thick along the entire combustion chamber surface. The combustion chamber consists mainly of a bowl in the face of the piston which can be approximated as a 3-cm-diameter hemisphere. Fuel is originally distributed equally throughout the chamber. Calculate the percent of fuel that does not get burned due to being trapped in the surface boundary layer.