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國立臺北科技大學106學年度碩士班招生考試

系所組別：1303 車輛工程系碩士班

第二節 熱力學 試題（選考）

注意事項：

1. 本試題共五題，每題二十分，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。

一、Air is flowing in a 0.3 m diameter pipe at a uniform velocity of 0.2 m/s. The temperature and pressure of air are 25^0C and 101.3 kPa. Determine the volume flow rate (10%) and the mass flow rate (10%). (Air $C_v = 0.7176 KJ/kgK$ ， $C_p = 1.004 KJ/kgK$ R=0.287 kN-m/kgK)

二、A piston/cylinder device contains 0.3 kg of air at 300K and 100kPa. The air is now slowly compressed in an isothermal process to a final pressure of 300kPa. Show the process in P-V diagram (6%)and find both the work (7%)and heat transfer (7%) in the process. .(Air $C_v = 0.7176 KJ/kgK$ ， $C_p = 1.004 KJ/kgK$ R=0.287 kN-m/kgK)

三 A car engine delivers 750 kW to the drive shaft with a thermal efficiency of 26%. The fuel has a heating value of 40000 kJ/kg. Find the rate of fuel consumption (10%) and the combined power rejected through the radiator and exhaust. (10%)

四、An Carnot cycle heat engine has an efficiency of 40%. If the high temperature is raised 10%. What is the new efficiency keeping the same low temperature? (20%)

五、An Otto cycle, process 1-2 is an isentropic compression of the air, process 2-3 is a constant volume process, heat is added to the air, process 3-4 is an isentropic expansion, process 4-1 is the rejection of heat from the air at a constant volume process. The compression ratio V_1/V_2 is 10.5. p_1=100kPa,T_1=288K. The heat transfer to the air per cycle is 1800kJ/kg air. Determine the maximum temperature of cycle T_3 (10%) the thermal efficiency. (10%)

(Air $C_v = 0.7176 KJ/kgK$ ， $C_p = 1.004 KJ/kgK$ R=0.287 kN-m/kgK, κ=1.4)