คณะวิศวกรรมศาสตร์
มหาวิทยาลัยสงขลานครินทร์

การสอบกลางภาค ประจำภาคการศึกษาที่ 1 ประจำปีการศึกษา 2555

วันที่ 6 สิงหาคม 2555 เวลา 09.00-12.00 น.

วิชา 215-231 Engineering Thermodynamic I ห้อง Robot

<u>คำสั่ง</u>

1. ข้อสอบมีทั้งหมด 5 ข้อ ให้ทำทุกข้อในข้อสอบ
2. อนุญาตให้นำกระดาษ A4 เข้าห้องสอบได้ 1 แผ่น
3. อนุญาตให้นำเครื่องคิดเลข, Talking Dictionary หรือพจนานุกรม เข้าห้องสอบได้

รศ.กำพล ประทีปชัยกูร

ผู้ออกข้อสอบ

ชื่อ-สกุล..... รหัส.....

ชื่อ-สกุล..... รหัส.....

1) Two sites are being considered for wind power generation. In the first site, the wind blows steadily at 7 m/s for 3000 hours per year, whereas in the second site the wind blows at 10 m/s for 2000 hours per year. Assuming the wind velocity is negligible at other times for simplicity, determine which is a better site for wind power generation. Hint: Note that the mass flow rate of the air is proportional to wind velocity. Given : $\rho_{air} = 1.25 \frac{kg}{m^3}$ (15 points)

ชื่อ-สกุล..... รหัส.....

2)

2.1 Complete this table for H_2O (5 points)

$T, ^oC$	P, kPa	$v, \frac{m^3}{kg}$	Phase description
50		7.72	
	400		Saturated vapor
250	500		
110	350		

2.2 The pressure in an automobile tire depends on the temperature of the air in the tire. When the air temperature is 25^oC, the pressure gage reads 210 kPa. If the volume of the tire is $0.025\ m^3$, determine the pressure rise in the tire when the air temperature in the tire rises to 50^oC. Also, determine the amount of air that must be bled off to restore pressure to its original value at this temperature. Assume the atmospheric pressure is 100 kPa.

Given: $R_{air} = 0.287 \frac{kPa.m^3}{kg.K}$ (10 points)

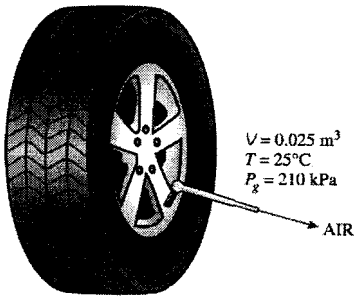

FIGURE P3–77

ชื่อ-สกุล..... รหัส.....

3)

3.1) A piston-cylinder device initially contains 0.07 m^3 of nitrogen gas at 130 kPa and 180°C. The nitrogen is now expands to a pressure of 80 kPa polytropically with a polytropic exponent whose value is equal to the specific heat ratio (isentropic expansion). Determine the final temperature and the boundary work done during this process.

Given: for N_2 $\quad R = 0.2968 \frac{kJ}{kg.K}, \quad k = 1.395$ (15 points)

ชื่อ-สกุล..... รหัส.....

3.2) Complete the table below on the basis of the conservation of energy principle for a closed system. (10 points)

Q_{in}, kJ	$W_{out,}$ kJ	E_1, kJ	E_2, kJ	M, kg	$e_2 - e_1$, kJ/kg
350		1020	860	3	
350	130	550		5	
	260	600		2	150
-500		1400	900	7	
	-50	1000		3	-200

4) Saturated R-134a vapor at 40°C is condensed at constant pressure to a saturated liquid in a closed piston-cylinder system. Calculate the heat transfer and work done during this process in kJ/kg. (25 points)

ชื่อ-สกุล..... รหัส.....

5) The piston diameters as shown in the figure are $D_1 = 8\ cm$ and $D_2 = 5\ cm$. The pressure in chamber 3 is 200 kPa. Chamber 1 contains 0.2 kg of air, and chamber 2 is filled with condensing R-134a. The entire assembly is maintained at $48^o C$. Determine the volume of chamber 1. Given: for air $R = 0.287 \frac{kPa.m^3}{kg.K}$ (15 points)

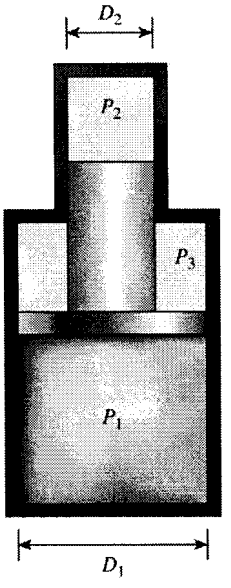

FIGURE P3–111