

Name _____ ID _____ 1



Prince of Songkla University
Faculty of Engineering

Midterm Test
7 August 2012
216-231 Engineering Thermodynamics I

Semester 1/2555
9.00-12:00
Room: S203

Name _____ ID _____

Direction:

1. All types of calculator, and dictionary are permitted.
2. There are totally 6 problems.

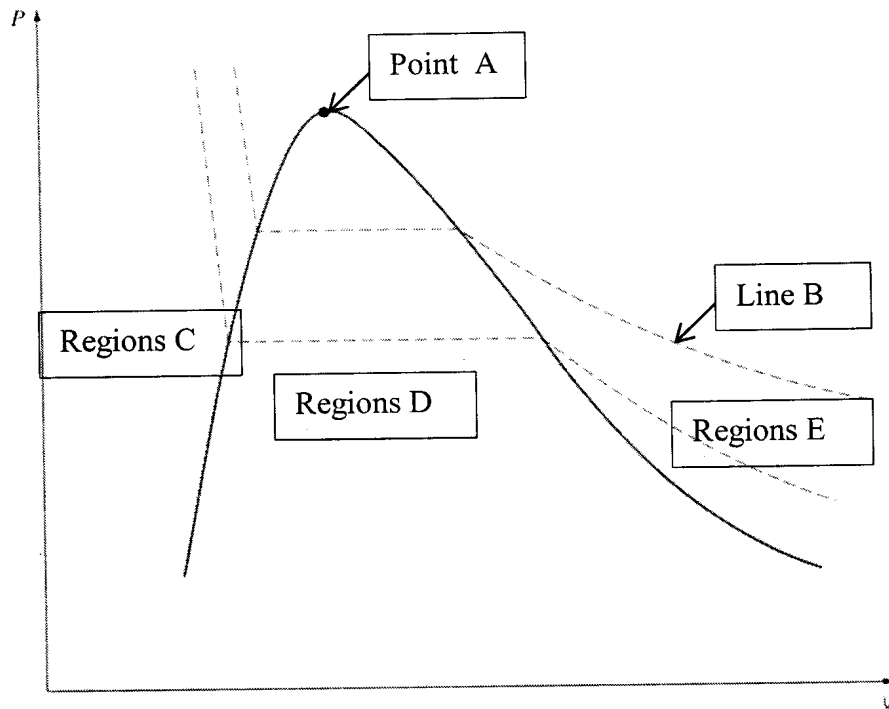
Nunthaphan Naphattharanun

Instructors

Problem No.	Full score	Your mark
1	18	
2	10	
3	10	
4	10	
5	20	
6	20	
Total	88	

1. Answer the following questions clearly. (18 points)

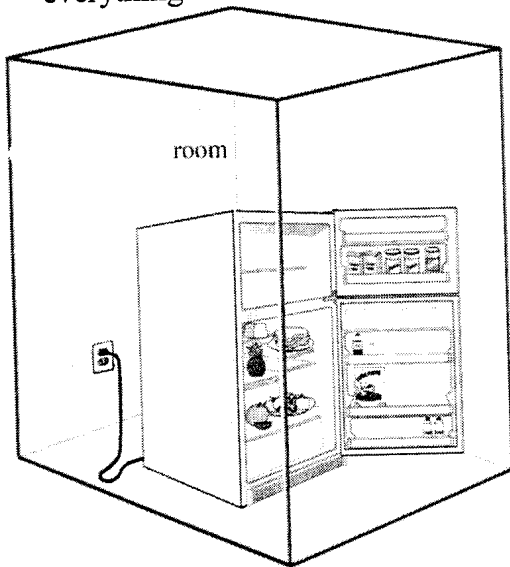
(a) From the chart below, describe the meanings of regions A to E and give their names. (10 points)



(b) Describe the meaning of the closed system? (4 points)

(c) Describe the meaning of the control volume? (4 points)

2. a) Consider an electric refrigeration located in a room. Determine the direction of the work and heat interactions (in or out) when the following are taken as the system: (a) the content of the refrigerator, (b) all parts of the refrigerator including the contents, (c) everything contained within the room during a winter day. (6 points)



b) An adiabatic closed system is accelerated from 0 m/s to 30 m/s. Determine the specific energy change of this system, in kJ/kg. (4 points)

3. If sufficient data are provided, complete the blank cells in the following table of properties of water. In the last column describe the condition of water as compressed liquid, saturated mixture, superheated vapor, or insufficient information; and, if applicable, give the quality. (10 points)

	P, kPa	T, °C	v, m ³ /kg	h, kJ/kg	Condition description and quality (if applicable)
a	198.67			2706.0	
b		130			0.650
c		500		3485.5	
d	800	30			
e		145			1.2

4. A 0.5-m^3 vessel contains 50 kg of water at 30°C . Determine (a) the pressure, (b) the total internal energy, and (c) the volume occupied by liquid phase. (10 points)

5. a) Saturated water vapor at 200°C is Isothermally condensed to saturated liquid in a piston-cylinder device. Calculate the heat transfer and the work done during this process, in kJ/kg . (10 points)

b) 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	$e_2 - e_1, \text{kJ/kg}$
a)	350		1020	860	5	
b)	350	130	550		3	
c)		260	600		4	150
d)	-500		1400	900		-50
e)		-50	1000		4	-200

6. A piston-cylinder device contains 0.15 kg of air initially at 2 MPa and 350°C. The air is first expanded isothermally to 500 kPa, then compressed polytropically with a polytropic exponent of 1.2 to 2 MPa, and finally compressed at constant pressure to initial state. Determine the boundary work for each process and the net work of the cycle.(20 points)

Given : The gas constant of air is $R = 0.287 \text{ kJ/kg.K}$