MEMS 0051
Spring 2017
Midterm #1
2/15/2017

Name (Print): _____

This exam contains 2 pages (including this cover page) and 5 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books or notes. Calculators are permitted on this exam.

The following rules apply:

- All work must be done in the blue testing book. Any work done on the exam question sheet will not be graded.
- All work must be substantiated. A result with no methodology and mathematics will not be graded.

Do not write in the table to the right.

Problem	Points	Score
1	10	
2	15	
3	20	
4	25	
5	30	
Total:	100	

Written Problem #1

1. (a) (5 points) Determine the quality of the water existing at 180 °C, 0.1400 [m^3/kg]

   (b) (5 points) Determine the mass of saturated vapor at 155 °C in a 40 [m^3] rigid tank.

Written Problem #2

2. (15 points) **What is the pressure** of 3 [kg] of air contained in a closed rigid room of 25 [m^3] if the temperature is 25 °C? **What is the new pressure** of the room if the temperature is double to 50 °C?

Written Problem #3

3. (20 points) **Determine the work** done by a piston-cylinder arrangement initially having a volume of 4 [m^3] and a pressure of 200 [kPa]. At the final state, the volume of the control mass is 25 [m^3], while the pressure drops to 80 [kPa]. **Determine the final temperature** if the initial temperature is 200 K.

Written Problem #4

4. (25 points) A piston-cylinder contains 2 [kg] of water with a volume of 0.1 [m^3] at 212.42°C. The piston is then expanded isothermally until the pressure drops to 1,000 [kPa]. **Find the total process work**. Note: this is a two-step process and only the second process is purely isothermal.

Written Problem #5

5. (30 points) 10 [kg] of water is contained within a piston-cylinder with a constant pressure occupies 0.633 [m^3] at a temperature of 450 °C. The system is then cooled to 20 °C. **Determine the work** done on the system **and the heat transfer** from the system.