Name: _____ Student ID _____

Prince of Songkla University

Faculty of Engineering

Exam: Midterm Exam, Semester II

Date: December 23, 2008

Subject: 230-302 Basic Chemical Engineering II

Academic Year: 2008

Time: 9.00-12.00

Room: R 201

Instructions:

- There are a total 6 questions.
- The exam is opened book.
- The points for each problem are not distributed evenly. Place your name and the student ID number on every page.
- Students are allowed to use a pen or pencil and a calculator.
- No exams are allowed to leave the room.

Points Distribution (For Grader Only)		
Question	Points Value	Score
1	20	
2	15	
3	25	
4	25	
5	25	
6	20	
Total	**130**	

GOOD LUCK!

Supawan Tirawanichakul

December 16, 2008

PLEASE CHECK TO MAKE SURE THAT

YOU HAVE ALL 7 PAGES OF THE EXAM BEFORE BEGINNING

(including the cover sheet)

1. (20 points) A house wall may by approximated as two 1.2 cm layers of fiber insulating board, an 8.0 cm layer of loosely packed asbestos, an a 10 cm layer of common brick. Assuming the convection heat transfer coefficient is 25 W/m^2 K on both sides of the wall.

    (a)   Calculate the overall heat-transfer coefficient.

    (b)   If the outside temperature is 40°C and the inside temperature is 20°C. Calculate the heat transfer per unit area.

2. (15 points) A vertical square plate, 30 cm on a site is maintained at 50°C and exposed to room air at 20°C. The surface emissivity is 0.8 .Calculate the total heat lost by both sides of the plate.

3. (25 points) A bottom of a copper pan, 150 mm. in a diameter, is maintained at 115°C by the heating of element of an electric range.

   (a)   Estimate the power require to boil the water in this pan.

   (b)   Calculate the evaporation rate.

4. (25 points) An aluminum fin 1.6 mm thick is placed on a circular tube with 2.5 OD. The fin is 6.4 mm. long. The tube wall is maintained at 150°C, the environment temperature is 25°C, and the convection heat transfer coefficient is 23 W/m^2 K. Calculate the heat lost by the fin.

5. (25 points) A square array of one thousand 3.5 mm diameter tubes is used condense steam at atmospheric pressure. The tube walls are maintained at 88°C by coolant flowing inside the tubes. Calculate mass of steam condensed per hour per unit length of the tubes.

6. (20 points) Estimate the diffusivity of carbon monoxide gas in gas mixture of oxygen: mole fraction = 0.10, nitrogen: mole fraction = 0.65, hydrogen: mole fraction = 0.1 and carbon monoxide: mole fraction = 0.15 at 298 K and 1.5 atm.