PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester I | Academic year : 2005

Date : October, 3, 2005 | Time : 9.00-12.00

Subject : 230-313 Heat Transfer | Room : R 300

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และพักการเรียน 1 ภาคการศึกษา โทษสูงสุด ให้ออก

1. ข้อสอบมีทั้งหมด 4 ข้อ
2. อนุญาตให้นำหนังสือหรือเอกสารทุกชนิดเข้าห้องสอบได้
3. ห้ามหยิบยืมเอกสารใดๆ และพูดคุยกับนักศึกษาอื่นขณะทำข้อสอบ

ข้อที่	คะแนนเต็ม	คะแนนที่ได้
1	25	
2	25	
3	25	
4	25	
รวม	100	

ชื่อ.....รหัส.....

1) a) A shell-and-tube heat exchanger with one shell pass and two tubes passes is designed to heat 5 kg/s of water from 30 to 50°C. The overall heat-transfer coefficient is 1500 W/m^2 °C. Hot water,heating fluid, cooled in shell side from 75°C to 60°C. Calculate the heat transfer rate and the area of heat exchanger.

   b) Calculate the heat transfer rate if flow rate of the hot water is cut in half.

ชื่อ.....รหัส.....

2) A counterflow double-pipe heat exchanger is currently used to heat 2.5 kg/s of water from 25 to 65°C by cooling an oil [c_p = 2.1 kJ/kg °C] from 130 to 80°C. It is desired to "bleed off" 0.5 kg/s of water at 50°C so that the single exchanger will be replaced by a two-exchanger arrangement which will permit this. The overall heat-transfer coefficient is 450 W/m^2 °C for the single exchanger and may be taken as this same value for each of the smaller exchangers. The same total oil flow is used for the two-exchanger arrangement and it is split equally between the two exchangers. Determine the areas of the smaller exchangers and the exit oil temperatures. Assume that the water flows in series through the two exchangers, with the bleed-off taking place between them.

ชื่อ.....รหัส.....

3) A heat exchanger is used to condense 5 kg/s of steam at atmospheric pressure. A square array of one hundred 20 mm-OD tubes is available for the task, and the tube wall is to be maintained at 97°C. Estimate the length of tubes required.

ชื่อ.....รหัส.....

4) Air at 200 kPa and 227^{o}C enters a 20 mm-ID tube at 10 m/s. The tube is constructed of copper (k =350 W/mK) with a thickness of 0.5 mm and a length of 3 m. Atmospheric air at 100 kPa and 100^{o}C flows normal to the outside of the tube with a free-stream velocity of 12 m/s. Calculate the air temperature at exit from the tube.