

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester I

Academic Year: 2016

Date: Oct 10, 2016

Time: 9.00-12.00

Subject: 231-311 Momentum and Heat Transfer

Room: R201

ทฤษฎีในการสอบโทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียน 1 ภาคการศึกษา

คำสั่ง

1. อนุญาตให้นำเอกสารเข้าห้องสอบได้
2. อนุญาตให้นำเครื่องคำนวณ (ไม่จำกักรุ่น) เข้าห้องสอบได้
3. ข้อสอบทั้งหมดมี 5 ข้อ ให้ทำหมดทุกข้อ
4. ข้อสอบมีทั้งหมด (10 แผ่น) ตอบในข้อสอบทั้งหมด ใช้ด้านหลังของกระดาษเขียนคำตอบได้

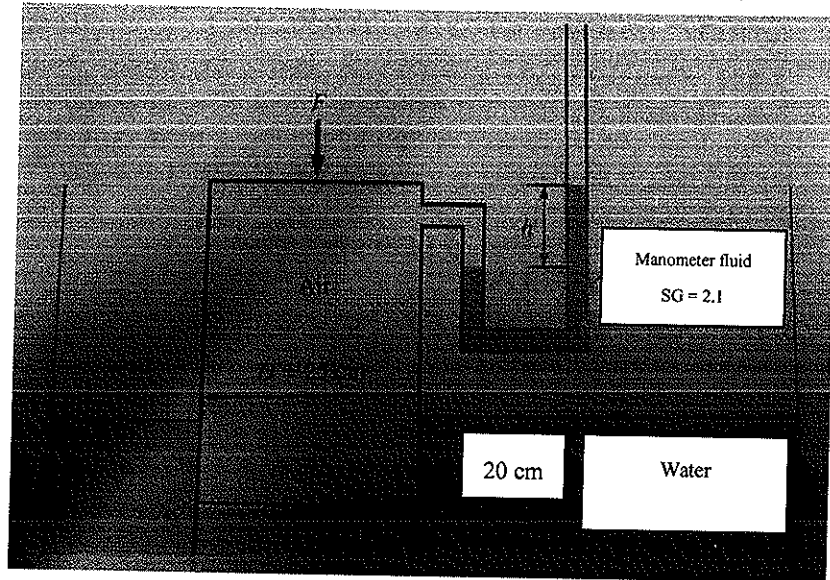
ชากริต ทองอุไร

รหัสนักศึกษา

ข้อที่	คะแนนเต็ม	คะแนนที่ได้
1	30	
2	30	
3	40	
4	40	
5	40	
รวม	180	

1. A viscometer constructed of two 30-cm-long concentric cylinders is used to measure the viscosity of a fluid. The outer diameter of the inner cylinder is 9 cm, and the gap between the two cylinders is 0.18 cm. The inner cylinder is rotated at 250 rpm, and the torque is measured to be 1.4 N.m. Find the viscosity of this fluid. (30 marks)

2. A cylindrical container whose weight is 64 N is inverted and pressed into the water, as shown in Fig. below. Determine the differential height h of the manometer and the force F needed to hold the container at the position shown. (30 marks)



3. The water in a 9-m-diameter, 2.4-m-high above ground swimming pool is to be emptied by unplugging a 3-cm-diameter pipe, near the bottom of the pool. Find a) the maximum discharge rate of water and (b) how long it will take to empty the swimming pool completely. (40 marks)

4. An oil pump is drawing 25 kW of electric power while pumping oil with $\rho = 860 \text{ kg/m}^3$ at a rate of $0.1 \text{ m}^3/\text{s}$. The inlet and outlet diameter of the pipe are 8 cm and 12 cm, respectively. If the pressure rise of oil in the pump is measured to be 250 kPa and the motor efficiency is 90 percent, determine the mechanical efficiency of the pump. Take the kinetic energy correction factor to be 1.05. (40 marks)

5. Consider the flow of oil with $\rho = 894 \text{ kg/m}^3$ and $\mu = 2.33 \text{ kg/m.s}$ in a 28-cm-diameter pipeline at an average velocity of 0.5 m/s. A 330-m-long section of the pipeline passes through the icy waters of a lake. Disregarding the entrance effects, determine the pumping power required to overcome the pressure losses and to maintain the flow of oil in the pipe. (40 marks)

