

ชื่อ-สกุล \_\_\_\_\_

รหัส \_\_\_\_\_

คณะวิศวกรรมศาสตร์  
มหาวิทยาลัยสงขลานครินทร์

การสอบปลายภาค ประจำปีภาคการศึกษาที่ 2

ประจำปีการศึกษา 2552

วันที่ 24 กุมภาพันธ์ 2553

เวลา 13.30-16.30 น.

วิชา 216-332 Engineering Thermodynamics II

ห้อง R 300

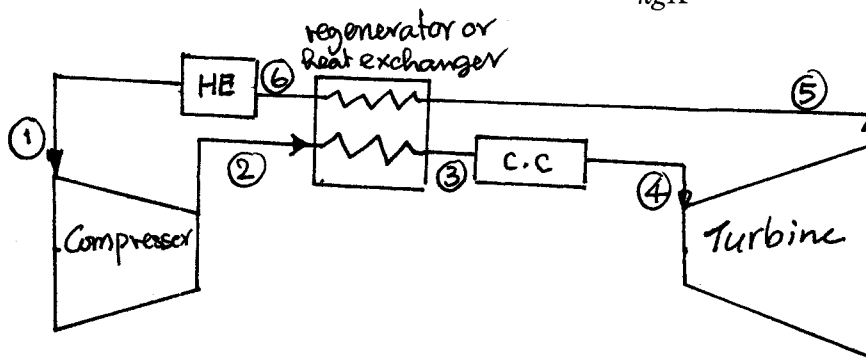
คำสั่ง

- ข้อสอบมีทั้งหมด 5 ข้อ ให้ทำทุกข้อในกระดาษคำตอบ

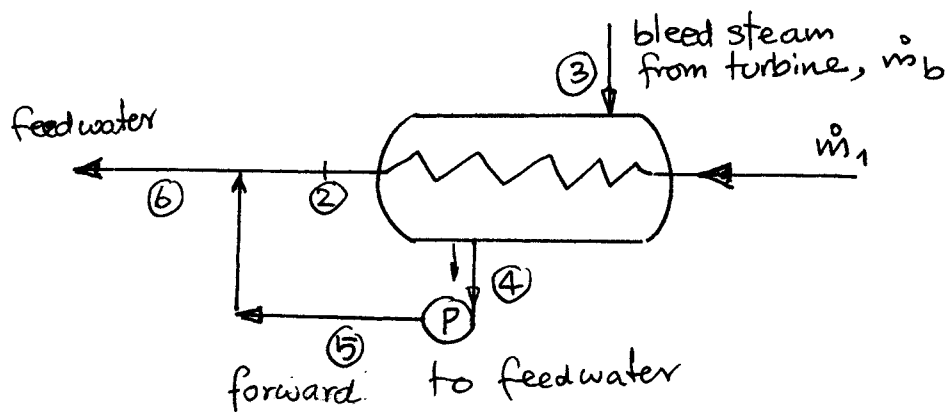
รศ.กำพล ประทีปชัยกุล

ผู้ออกข้อสอบ

1) An ideal regenerator ( $T_3 = T_5$ ) is added to a simple ideal Brayton cycle. Air enters the compressor of this cycle at  $90 \text{ kPa}, 10^\circ \text{C}$ , the pressure ratio is 8, and the maximum cycle temperature is  $815^\circ \text{C}$ . What is the thermal efficiency if this cycle? What would the thermal efficiency of the cycle be without the regenerator. Draw T-s diagram of the cycle. Given: for air  $C_p = 1.005 \frac{\text{kJ}}{\text{kgK}}$ ,  $k = 1.4$  (25 marks)



2) In a regenerative Rankine cycle, the closed feedwater heater with a pump as shown is arranged so that the water at state 5 is mixed with the water at state 2 to form a feedwater which is saturated liquid at 1.4 MPa. Feedwater enters this heater at  $175^\circ\text{C}$  and 1.4 MPa with a flow rate of  $1 \frac{\text{kg}}{\text{s}}$ . Bleed steam is taken from the turbine at 1 MPa,  $200^\circ\text{C}$ , and enters the pump as a saturated liquid at 1 MPa. Determine the mass flow rate of bleed steam required to operate this unit. (25 marks)



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3) A mixture of nitrogen and carbon dioxide with a carbon dioxide mass fraction of 50% has a constant volume specific heat of  $0.792 \frac{kJ}{kg.K}$ . This mixture is heated at constant pressure in a closed system from  $120 \text{ kPa}$ ,  $30^\circ \text{C}$  to  $200^\circ \text{C}$ . Calculate the work produced during the heating in  $\frac{kJ}{kg}$ .

$$\text{Given: } M_{N_2} = 28 \frac{kg}{kmol} \quad , \quad M_{CO_2 kmol} = 44 \text{ kg}$$

(25 marks)

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4) Octane gas ( $C_8H_{18}$ ) is burned with 100% excess air in a constant pressure burner. The air and fuel enter this burner steadily at standard conditions and the products of combustion leave at  $257^\circ C$ . Calculate the heat transfer, in  $\frac{kJ}{kg_{fuel}}$ , during this combustion. (25 marks)

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- 5) What is the adiabatic flame temperature of methane ( $CH_4$ ) when it is burned with 30% excess air. All reactants enter at  $25^\circ C, 1 atm$ . (25 marks)