國立臺灣海洋大學 101 學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目：熱流學（含熱力學及流體力學）

系所名稱：機械與機電工程學系碩士班微系統B組(聯)、
機械與機電工程學系碩士班熱流組(聯)　　* 可使用計算器

1.答案以橫式由左至右書寫。2.請依題號順序作答。

1. (20%) Explain the following terms:
   (a) Control mass and control volume.
   (b) The 0^{th} law of thermodynamics.
   (c) Intensive and extensive properties.
   (d) Streamline, pathline, and streakline.
   (e) Static, dynamic, stagnation, and total pressures.

2. (20%) The mass rate of flow into a steam turbine is 1.5 kg/s, and the heat transfer from the turbine is 8.5 kW. The following data are known for the steam entering and leaving the turbine.

	Inlet Conditions	Exit Conditions
Pressure	2.0 MPa	0.1 MPa
Temperature	350 ℃	
Quality		100%
Velocity	50 m/s	200 m/s
Elevation above reference plane	6 m	3 m
Specific enthalpy	3137.0 kJ/kg	2675.5 kJ/kg

$g = 9.8066\ m/s^2$

Determine the power output of the turbine.

3. (20%) A thin rectangular plate having a width w and a height h is located so that it is normal to a moving stream of fluid. Assume that the drag, D, that the fluid exerts on the plate is a function of w and h, the fluid viscosity, μ and ρ, respectively, and the velocity, V, of the fluid approaching the plate. Determine a suitable set of Pi terms (Buckingham Pi theorem) to study this problem experimentally.

4. (20%) What's the air-standard Carnot cycle? And please draw out the (a) P-v, (b) U-S, (c) H-T, and (d) P-T diagrams. Note that where P, v, U, S, H, and T are pressure, specific volume, internal energy, entropy, enthalpy, and temperature, respectively.

5. (20%) Derive an expression for the change in height (h) in a capillary tube of a liquid with surface tension (σ) and constant angle (θ), as show in Figure P5.

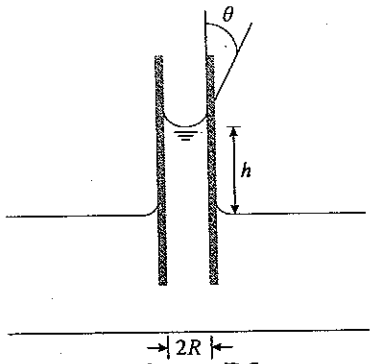

Figure P5