

八十八學年度 動力機械 系(所) 甲 組碩士班研究生招生考試

科目 熱流學 II 科號 1201 共 1 頁第 1 頁 *請在試卷【答案卷】內作答

Heat Transfer

1. (a) Please define the efficiency of a fin (5%); and discuss its physical significance for a fin under natural convection or forced convection, respectively. (5%)
 (b) What are the assumptions for analyzing the problem of a one-dimensional heat conductive fin, which has both convective heat and radiative heat transferred to the surroundings? (15%)
2. Please define and discuss the following dimensionless parameters:(25%, 5% each)
 - (a) Rayleigh number in natural convection
 - (b) Reynolds number in forced convection
 - (c) Eckert number in forced convection
 - (d) Nusselt number in convective heat transfer
 - (e) Prandtl number in convective heat transfer
3. (a) Within the wavelength (λ) range of 0.1 to 100 μm , draw three curves of $E_{\lambda,b}$ (spectral blackbody emissive power) versus λ in a log-log diagram, respectively for body temperatures of 5800K, 1000K, and 300K. Also indicate the names of some important wavelength ranges. (12%)
 (b) Explain why a night-vision scope (夜視鏡) works in the infrared range.(4%)
 (c) Write the formula for the total blackbody emissive power, and indicate what the quantity corresponds to in the above diagram. (5%)
 (d) Compare the distributions of spectral emissive power $E_{\lambda}(\lambda)$ of a blackbody and a gray body of $\varepsilon = 0.5$. (4%)

Fluid Mechanics

4. (a) For a steady, laminar, incompressible, viscous flow between two large flat plates, draw a few flow velocity distributions across the sections respectively in the entrance and the fully-developed region. The velocity distribution at the inlet is uniform. Also indicate what parameters the velocity u depends on in each region. (9%)
 (b) Draw the pressure distribution $p(x)$ from the inlet. Also explain why the distribution is like this. (7%)
 (c) Write the governing equations in the simplest form respectively for the entrance and the fully-developed region. (9%)