

机械与动力工程学院博士生资格考试笔试大纲

Syllabus of Ph.D. Qualification Examination (SJTU-ME)

*笔试主题 Exam Topic	(中文) 高等传热学
	(English) Advanced Heat Transfer
*考核形式 Exam Format	闭卷考试, 1 小时 Closed-book exam, 1 hour
*考核目标 Exam Target	<p>1、掌握传热的基本规律和相关公式, 并能用于工程传热建模与求解; 2、应用传热基本原理分析工程传热问题和主要因素的影响规律;</p> <p>1. Mastering basic laws and related formulas of heat transfer, and using them in modeling and solving engineering heat transfer problems; 2. Applying basic principles of heat transfer to analyze engineering heat transfer problems and the influences of main factors;</p>
*考核内容 Exam Contents	<p>1、三种传热方式, 传热过程和传热系数, 传热学的研究方法等; 2、稳态热传导: 傅里叶导热定律, 导热问题的数学描写, 典型问题的分析解等; 3、非稳态热传导: 基本概念、集中参数法、典型问题的分析解等; 4、多维稳态导热和非稳态导热的分离变量求解方法、近似分析法等; 5、热传导问题的数值解法: 数值求解的基本思想和离散方程的建立方法等; 6、对流传热的理论基础: 对流传热的数学描写, 边界层概念及应用, 比拟理论等; 7、外部流动和内部流动边界层分析解; 8、单相对流传热: 相似原理与量纲分析, 实验关联式的使用等; 9、相变对流传热: 凝结和沸腾换热的概念、特性、关联式、强化方法等; 10、热辐射基本定律和辐射特性; 11、辐射传热的计算: 角系数、表面辐射的净热流、热阻分析、气体辐射特性、辐射传热的控制等; 12、传热过程分析与换热器热计算等;</p> <p>1. Three basic styles of heat transfer, heat transfer process and heat transfer coefficient, research methods of heat transfer, etc. 2. Steady state heat conduction, such as Fourier heat conduction law, mathematical description of heat conduction problems, analytical solutions to typical problems, etc. 3. Unsteady state heat conduction: basic concepts, lumped parametric method, analytical solutions to typical problems, etc. 4. Different methods (variable separation method, approximate analytical method, etc.) to solve the multidimensional steady and transient thermal conduction problems; 5. Numerical solution of heat conduction problem: basic idea of numerical solution, methods of establishing discrete equation, etc.</p>

	<p>6. Theoretical basis of convective heat transfer: mathematical description of convective heat transfer, concept and application of boundary layer, analogy theory, etc.</p> <p>7. Analytical solutions of boundary layer equations for external flow and internal flow.</p> <p>8. Single phase convection heat transfer: similarity principle and dimensional analysis, use of experimental correlations, etc.</p> <p>9. Convective heat transfer with phase change: concepts, characteristics, experimental correlations and strengthening principles of condensation and boiling heat transfer, etc.</p> <p>10. Laws of thermal radiation and radiation characteristics.</p> <p>11. Calculation of radiation heat transfer, such as angle factor, net heat flow of radiation surface, thermal resistance analysis, gas radiation characteristics, control of radiation heat transfer, etc.</p> <p>12. Analysis of heat transfer process and thermal calculation of heat exchanger.</p>
*参考书目 References	<p>教材:</p> <p>杨世铭, 陶文铨. 《传热学》. 高等教育出版社, 第四版, 书号: 7-04-018918-6</p> <p>参考书:</p> <p>1、 Incropera, Deweitt and et. al. 《Fundamentals of heat and mass transfer》. Wiley , 2007, ISBN: 978-0-471-794714</p> <p>2、 陶文铨编著. 《数值传热学》. 西安交通大学出版社, 2001, ISBN: 7-5605-1436-7</p> <p>3、 王秋旺, 曾敏主编. 《传热学要点与解题》. 西安交通大学出版社, 2006, ISBN: 7-5605-2258-0</p> <p>4、 余其铮编著. 《辐射换热原理》. 哈尔滨工业大学出版社. 2000, ISBN: 7-5603-1570-4/TK.30</p> <p>5、 胡小平, 任海峰编著. 《传热学考试要点与真题精解》. 国防科技大学出版社. 2007, ISBN: 978-781099-425-5</p> <p>6、 (美)V. S. 阿巴兹, P. S. 拉森. 《对流换热》. 2007, 高等教育出版社. ISBN: 7-04-001084-4/TH.170</p> <p>7、 奥齐西克 M N;热传导;高等教育出版社;1983</p> <p>8、 张洪济;热传导;高等教育出版社;1992</p> <p>9、 Bejan, A., Convection Heat Transfer, John Wiley & Sons, 1995</p> <p>10、 王启杰, 对流传热传质分析, 西安交通大学出版社, 1991</p> <p>11、 Kays W M, Crawford M E;Convective Heat and Mass Transfer;McGraw Hill;1980</p>
备注 Notes	