

- Preface p. xiv
- 1 Convection with Simplified Constraints p. 1
  - 1.1 Introduction p. 1
  - 1.2 Extended Surface Heat Transfer p. 6
  - 1.3 Longitudinal Fins p. 10
  - 1.4 Radial Fins p. 25
  - 1.5 Spines p. 40
  - 1.6 Nomenclature p. 57
- 2 Convection with Real Constraints p. 59
  - 2.1 Introduction p. 59
  - 2.2 Fins with Tip Heat Loss p. 60
  - 2.3 Nonuniform Heat Transfer Coefficients p. 81
  - 2.4 Fins with Internal Heat Generation p. 91
  - 2.5 Polygonal Fins p. 94
  - 2.6 Closure p. 99
  - 2.7 Nomenclature p. 99
- 3 Convective Optimizations p. 102
  - 3.1 Introduction p. 102
  - 3.2 Quest for the Optimum Profile p. 105
  - 3.3 Optimum Shapes of Longitudinal Fins p. 109
  - 3.4 Optimum Shapes of Radial Fins p. 117
  - 3.5 Optimum Spine Dimensions p. 132
  - 3.6 Improved Analyses for Convecting Fins p. 138
  - 3.7 Closure p. 157
  - 3.8 Nomenclature p. 158
- 4 Convection Coefficients p. 160
  - 4.1 Introduction p. 160
  - 4.2 Fluid Flow Considerations p. 161
  - 4.3 Heat Transfer Considerations p. 171
  - 4.4 Correlations for Forced Convection Heat Transfer p. 172
  - 4.5 Natural Convection p. 190
  - 4.6 Closure p. 207
  - 4.7 Nomenclature p. 217
- 5 Linear Transformations p. 220
  - 5.1 Introduction p. 220
  - 5.2 Limitations of Fin Efficiency p. 221
  - 5.3 Longitudinal Fin of Rectangular Profile Revisited p. 223
  - 5.4 Linear Transformation p. 226
  - 5.5 Other Linear Transformations p. 226
  - 5.6 Summary of All Conversions p. 234
  - 5.7 Formal Development of the Linear Transformations p. 234
  - 5.8 Example of Finding the Parameters p. 238
  - 5.9 Input Admittance and the Thermal Transmission Ratio p. 240
  - 5.10 Nomenclature p. 242

- 6 Elements of Linear Transformations p. 244
- 6.1 Introduction p. 244
- 6.2 Regular Fins and Spines p. 245
- 6.3 Singular Fins and Spines p. 290
- 6.4 The Single Series Resistance p. 302
- 6.5 The Single Shunt Conductance p. 304
- 6.6 Closure p. 305
- 6.7 Nomenclature p. 306
- 7 Algorithms for Finned Array Assembly p. 308
- 7.1 Introduction p. 308
- 7.2 Algorithms for the Combination of Fins p. 309
- 7.3 Cascade Algorithm and the Variable Heat Transfer Coefficient p. 329
- 7.4 Nomenclature p. 335
- 8 Advanced Array Methods and Array Optimization p. 337
- 8.1 Introduction p. 337
- 8.2 Multiple Heat Inputs p. 338
- 8.3 Node Analysis of Finned Arrays p. 342
- 8.4 General Analysis Method p. 359
- 8.5 Optimization of Finned Arrays p. 368
- 8.6 Optimum (Least Material) Arrays of Fins p. 375
- 8.7 Optimum Natural-Convection Heat Sinks p. 381
- 8.8 Nomenclature p. 387
- 9 Finned Passages p. 390
- 9.1 Introduction p. 390
- 9.2 Finned Passage p. 391
- 9.3 Input Admittance and the Fin Efficiency p. 391
- 9.4 Overall Passage Efficiency p. 394
- 9.5 Single Stack p. 394
- 9.6 Double Stack p. 408
- 9.7 n-Stack p. 426
- 9.8 Closure p. 441
- 9.9 Nomenclature p. 441
- 10 Compact Heat Exchangers p. 443
- 10.1 Introduction p. 443
- 10.2 Heat Transfer and Flow Friction Data p. 455
- 10.3 [set membership]-N[subscript tu] Method p. 457
- 10.4 Design of a Compact Heat Exchanger p. 473
- 10.5 Nomenclature p. 486
- 11 Longitudinal Fin Double-Pipe Exchangers p. 489
- 11.1 Introduction p. 489
- 11.2 Plain Double-Pipe Exchanger p. 489
- 11.3 Longitudinal Fin Double-Pipe Exchanger p. 494
- 11.4 Heat Transfer Coefficients in Pipes and Annuli p. 503
- 11.5 Pressure Loss in Pipes and Annuli p. 507

- 11.6 Complete Design p. 508
- 11.7 Series-Parallel Arrangements p. 519
- 11.8 Multiple-Finned Double-Pipe Exchangers p. 530
- 11.9 Closure p. 538
- 11.10 Nomenclature p. 538
- 12 Transverse High-Fin Exchangers p. 540
- 12.1 Introduction p. 540
- 12.2 Bond or Contact Resistance of High-Fin Tubes p. 542
- 12.3 Fin Efficiency Approximation p. 549
- 12.4 Air-Fin Coolers p. 551
- 12.5 Nomenclature p. 569
- 13 Fins with Radiation p. 572
- 13.1 Introduction p. 572
- 13.2 Longitudinal Radiating Fin of Rectangular Profile p. 577
- 13.3 Longitudinal Radiating Fins of Trapezoidal and Triangular Profile p. 594
- 13.4 Use of the Cascade Algorithm p. 602
- 13.5 Longitudinal Radiating Fin with Constant-Temperature Gradient p. 605
- 13.6 Parabolic Radiating Profiles p. 611
- 13.7 Radial Radiating Fins p. 614
- 13.8 Closure p. 633
- 13.9 Nomenclature p. 633
- 14 Optimum Design of Radiating and Convecting-Radiating Fins p. 636
- 14.1 Introduction p. 636
- 14.2 Optimum Dimensions of Longitudinal Radiating Fins p. 636
- 14.3 Optimum Dimensions of Radiating Spines p. 651
- 14.4 Improved Optimization Analyses for Radiating Fins p. 657
- 14.5 Fin-to-Fin and Fin-to-Base Radiation Interchange p. 681
- 14.6 Optimum Dimensions of Longitudinal Convecting-Radiating Fins p. 686
- 14.7 Optimum Dimensions of Radial Radiating Fins p. 690
- 14.8 Miscellaneous Studies p. 695
- 14.9 Nomenclature p. 696
- 15 Multidimensional Heat Transfer in Fins and Fin Assemblies p. 699
- 15.1 Introduction p. 699
- 15.2 Longitudinal Fin of Rectangular Profile with Convection p. 700
- 15.3 Convecting Longitudinal Fin of Triangular Profile p. 717
- 15.4 Convecting Cylindrical Spine or Pin Fin p. 721
- 15.5 Radial Rectangular Profile Convecting Fin p. 725
- 15.6 Composite Fins p. 731
- 15.7 Convecting Fin Assemblies p. 734
- 15.8 Radiating and Convecting-Radiating Fins and Fin Assemblies p. 743
- 15.9 Additional Studies p. 750
- 15.10 Nomenclature p. 751
- 16 Transient Heat Transfer in Extended Surfaces p. 754
- 16.1 Introduction p. 754

- 16.2 Longitudinal Fin of Rectangular Profile p. 754
- 16.3 Radial Convecting Fin p. 774
- 16.4 Longitudinal Fins with Power Law Dissipation p. 784
- 16.5 Longitudinal Convecting-Radiating Fins p. 796
- 16.6 Two-Dimensional Effects and Transient Heat Flow p. 799
- 16.7 Composite Fins p. 805
- 16.8 Variable Heat Transfer Coefficient p. 813
- 16.9 Miscellaneous Studies p. 814
- 16.10 Closure p. 816
- 16.11 Nomenclature p. 816
- 17 Periodic Heat Flow in Fins p. 819
- 17.1 Introduction p. 819
- 17.2 Longitudinal Fin of Rectangular Profile p. 819
- 17.3 Radial Fin of Rectangular Profile p. 839
- 17.4 Additional Studies p. 841
- 17.5 Nomenclature p. 842
- 18 Boiling from Finned Surfaces p. 844
- 18.1 Introduction p. 844
- 18.2 Evaporation p. 849
- 18.3 Boiling p. 852
- 18.4 Performance of a Single Cylindrical Spine p. 863
- 18.5 Optimum Dimensions for the Cylindrical Spine p. 868
- 18.6 Minimum Mass Spine p. 870
- 18.7 Extended Surfaces in Moist Air p. 872
- 18.8 Nomenclature p. 877
- 19 Condensation on Finned Surfaces p. 880
- 19.1 Introduction p. 880
- 19.2 Condensation on Single Fins p. 884
- 19.3 Dehumidification of Air on Fins p. 909
- 19.4 Horizontal Integral-Fin Tubes p. 924
- 19.5 Internally Finned Tubes p. 939
- 19.6 Microfin Tubes p. 942
- 19.7 Nomenclature p. 944
- 20 Augmentation and Additional Studies p. 948
- 20.1 Augmentation p. 948
- 20.2 Heat Transfer in Electronic Equipment p. 955
- 20.3 Heat Pipes p. 959
- 20.4 Solar Collectors and Related Equipment p. 959
- 20.5 Finned Regenerators p. 960
- 20.6 Numerical Analyses p. 960
- 20.7 Mathematical Techniques p. 962
- 20.8 Turbine Blades p. 964
- 20.9 Design Methods p. 965
- 20.10 Freezing or Melting on the Fin Faces p. 965

- 20.11 Heat and Mass Transfer p. 965
- 20.12 Miscellaneous Citations p. 966
- 20.13 Nomenclature p. 969
- Appendix A Gamma and Bessel Functions p. 971
- Appendix B Matrices and Determinants p. 1005
- References p. 1034
- Author Index p. 1075
- Subject Index p. 1087