CONTENTS

PREFACE

SECTION 1 GENERAL VISCOUS FLOW

1. M. ISRAELI, V. REITMAN, S. SOLOMON and M. WOLFSHTEIN 3
"On the marching solution of elliptic equations in viscous fluid mechanics"

2. M.D. OLSON and J.F. BALDWIN 15
"Eigenvalue petubation of Navier Stokes equations by finite elements"

3. P.M. GRESHO, S.T.K. CHAN, R.L. LEE and C.D. UPSON 27
"Solution of time-dependent, three dimensional incompressible Navier-Stokes equations via a finite elements"

4. R.L. SANI and B.E. EATON 41
"On the solution of the time-dependent incompressible Navier-Stokes equations via a penalty Galerkin finite element method"

5. Y. LECIONTE and J. PIQUET 53
"On the numerical solution of same types of unsteady incompressible viscous flow"

6. A. DANAEE and D.J. EVANS 65
"The application of boundary value techniques in the solution of the Navier-Stokes equations"

7. L. QUARTAPELLE, F. VALZ-GRIS and M. NAPOLITANO 79
"Intergral conditions on the vorticity:numerical alogorithms for the steady and unsteady Navier-Stokes equations"

8. R.K. ROUT, A. ECER and P. WARD 91
"Investigation of solution of Navier-Stokes equations using a variational formulation"

9. W.C. HORAK and J.J. DORNING 103
"A modal Green's tensor method for the efficient numerical solution of laminar flow problems"

10. F.J.K. IDERIAH 113
"The numerical computation of laminar pipe flow"

11. M.B. BUSH and R.I. TANNER 119
"The boundary element method applied to creeping motion of a sphere"

12. J.H. WANG and W.J. YANG 129
"Numerical solutions for laminar flows in disc-type strrers"

13. T. THUNELL and L. FUCHS 141
"Numerical solution of the Navier-Stokes equations by multi-grid techniques"

14. K. NANDARKUMAR and J.H. MASLIYAH 153
"Laminar flow in curved moon shaped ducts"

15. L. FUCHS and H. ZHAO 167
"Numerical simulation of three dimensional flows in ducts"

16. G. DHATT 179
"Different finite element formulations for the Navier-Stokes equations"

17. J. RIEDLER 191
"Quasi three-dimensional finite element solution for a twin extruder"

SECTION 2 TURBULENT FLOW

1. G. GOUESBET and A. BERLAMONT 205
"Prediction of turbulent fields, including fluctuating velocity correlations and approximate spectra, by means of a simple second order closure scheme: the round free jet and developed pipe flow"

2. P.M. BAUER, F. HOISLBAUER, H. BARTOSCH and C. JAQUEMAR 217
"Numerical solution of electromagnetically driven liquid metals"

3. A.G. HUTTON and R.M. SMITH 229
"On the finite element simulation of incompressible turbulent flow in general two dimensional geometries"

4. C.W. RAPLEY 243
"The prediction of local mean flow characteristics for fully developed turbulent flow in straight non-circular passages"

5. Z. MAZHAR and G.D. RAITHBY 255
"A refined PUMPIN (Pressure Update by Multiple Path Integration) method for updating pressures in the numerical solution of the incompressible fluid flow equations"

6. W. SLAGTER and H.A. ROODBERGEN 267
"Prediction of developing turbulent flow by the finite element method"

7. R.W. DAVIS and E.F. MOORE 279
"The numerical simualtion of flow around squares"

8. O. KVERVOLD, A.K. RASTOGI and T. SØNTVEDT 291
"Turbulent flow and turbulent mass transfer in partly closed pipes and channels"

9. M. BUFFAT, D. JEANDEL and J.F. BRISON 303
"Improvements of the optimal control method to solve turbulent flows"

10. P. MELE, M. MORGANTI, A. Di CARLO and A. TATONE 315
"Laminar to turbuent flow study by means of the F.E.M."

11. A. BERLEMONT and G. GOUESBET 327
"Prediction of the behaviour of a cloud of discrete particles released in a fully developed turbulent pipe flow, using a non-discrete dispersive approach"

12. M.M.M. ABOU-ELLAIL and T.W. ABOU-ARAB 339
"Prediction of turbulent mixing in confined co-axial reacting jets"

13. J.K. PLATTEN, J.M. LUIJKX and P. FLANDROY 351
"On the transition to turbulence"

14. E.E. KHALIL and H.M.W. ASSAF 363
"Computer modelling of turbulent recirculating flows in engineering applications"

15. A. POLLARD 377
"On the calculation of the laminar and turbulent flow between parallel discs"

16. B.J. ALFRINK 389
"On the Neumann problem for the pressure in a Navier-Stokes model"

17. J.I. RAMOS 401
"A numerical study of confined turbulent jets"

18. I. GRANT, F.H. BARNES and T.H. LOON 413
"The prediction of the drag on structural beams"

19. F. BOYSAN and J. SWITHENBANK 425
"Numerical prediction of combined vortex flows"

20. V.K. GARG 439
"Finite difference solution for axially developing flow in an annulus"

21. C. TAYLOR, C.E. THOMAS and K. MORGAN 449
"F.E.M. and the two equation model of turbulance"

SECTION 3 BOUNDARY LAYER ANALYSIS

1. C. PATTERSON and M.A. SHEIK 463
"Regular boundary integral equations for fluid flow"

2. A. POSTAD, O. PADE, D. ANSHELOVITZ and M. WOLFSHTEIN 475
"Accurate solutions for laminar and turbulent boundary layers and very large pressure gradient parameters"

3. S.P. KLOTZ and R.L. STREET 487
"The numerical simulation of the turbulent boundary layers at a rough air-water interface"

4. C-C HSU and A. LIAKOPOULOS 497
"A finite element differential method for a class of compressible laminar boundary-layer flows"

5. A.R. WADIA and F.R. PAYNE 505
"On the OLP prediction of the unstable modes of the flat plate turbulent boundary layer"

6. S.P. KLOTZ and R.L. STREET 517
"On the simulation of the coupled laminar boundary layers at a smooth, phase changing gas-liquid interface"

7. V. GANESAN and B.H.L. GOWDA 531
"Numerical prediction of turbulent boundary layer developement on a two-dimensional curved wall"

SECTION 4 FLOW WITH HEAT TRANSFER

1. B.P. LEONARD 543
"A stable, accurate, economical and comprehendible algorithm for the Navier-Stokes and scalar transport equations"

2. Ph. ROUZAUD, J. CHINARDET, B. GAY and R. VERBIEST 555
"Thermal hydraulic calculations of wire-wrapped bundles using a finite element method. THESEE code"

3. P.L. VIOLLET 569
"On the computing of turbulent Heat and Mass Transfer for the computation of buoyancy affected flows"

4. J.A. RIEZES 581
"Developing compressible flow between parallel heated plates"

5. G. GROTZBACH 593
"Spatial resolution requirements for numerical simulation of internally heated fluid layers"

6. S. DEL GIUDICE and A. TROTTA 605
"Heat and mass transfer in tubular reactors: a finite element approach"

7. L. KATGERMAN 615
"A numerical solution of ribbon thickness formation during meltspinning"

8. L.A. BERTRAM 625
"Numerical 'turbulent transition', locus for continuous casting type flows"

9. A.M. GOORAY, C.B. WATKINS and W. AUNG 639
"Numerical calculations of turbulent heat transfer downstream of a rearward facing step"

10. M.S. KHADER and J.S. GOODLING 653
"Low Reynolds number heat transfer in cylindrical packed beds"

11. T. DROZD 665
"Momentum and heat transfer characteristics in turbulent flow"

SECTION 5 FREE SURFACE FLOW

1. G. LABADIE, J.P. BENQUE and B. LATTEUX 681
"A finite element method for the shallow water equations"

2. E.P. QUERNER 693
"The finite element method applied to turbulent open channel flow"

3. E.W. MINER, O.M. GRIFFIN, S.E. RAMBERG and M.J. FRITTS 705
"A numerical and experimental study of free surface wave flow over a half cylinder"

4. D.L.C. LAM 719
"Stratified flow models for Lake Eirie"

5. N. PRAAGMAN 731
"Numerical models for the computation of residual currents"

6. T.W. KAO 741
"Current and density structure in shelf waters due to fresh water discharge : a numerical Study"

7. A.D. JENKINS 753
"Determination of tidal residual currents in wide estuaries using finite element methods"

8. J. BENNER 763
"Some variants of the ICE technique"

SECTION 6 TURBOMACHINERY AND AIR FOIL FLOW

1. K.Y. SZEMA and C.H. LEWIS 777
"Computation of three-dimensional hypersonic viscous flows over lifting bodies at high angles of attack"

2. A.S. ÜCER, I. YEĞEN and T. CETINLAYA 789
"A finite element solution of compressible flow through cascades of turbo machines"

3. M.A. SERAG-ELDIN 801
"Semi-elliptic computation of axi-symmetric transonic flows"

4. M.D. KIM, R.R. THAREJA and C.H. LEWIS 813
"Hypersonic viscous flows in a streamline coordinate system"

SECTION 7 TWO PHASE FLOW

1. R.I. ISSA and A.D. GOSMAN 827
"The computation of three-dimensional turbulent two-phase flows in mixer vessels"

2. W.H. LEE and V.L. SHAN 841
"Numerical simulation for two-phase jet problem"

3. T. SPENDEL 853
"Condensation heat transfer in two-phase thermo-syphons"

4. I.P. JONES and A.V. JONES 863
"The numerical solution of simple one-dimensional multi-phase flows in shock tubes"

5. L. CONTRI and B.A. SCHREFLER 877
"A microstructural multiphase material model for concrete"

6. L.G. NHAN and G. DE VAHL DAVIS 893
"A numerical study of barbotage"

7. S. KIEDA, K. SUZUKI and T. SATO 905
"Numerical study on flow behaviour and heat transfer in the vicinity of starting point of transpiration"

8. T. SIIKONEN 917
"An application of the method of characteristics for the simulation of single and two-phase flow"

9. A.C. BUCKINGHAM and W.J. SIEKHAUS 929
"Simulating interactions between turbulence and particles in erosive flow and transport"

SECTION 8 MASS TRANSPORT AND CONVECTION

1. W. SCHONAUER, K. RAITH and G. GLOTZ 943
"The selfadaptive solution of nonlinear 2-D boundary value problems in a rectangular domain"

2. Y. KRONZON, I. PARTOM and M. WOLFSHTEIN 955
"Numerical solution of the momentum equations in unsteady incompressible flow"

3. A. SATAKE and J.N. REDDY 965
"Natural convection between concentric (horizontal) circular cylinders by a penalty - finite element method"

4. K. RAMAKRISHNA, P.K. KHOSLA and S.G. RUBIN 981
"Laminar natural convection along vertical corners and rectangular channels"

5. E. LEONARDI, J.A. RIEZES and G. DE VAHL DAVIS 995
"Natural convection in a rotating annulus"

6. O. KVERNVOLD, A.K. RASTOGI and T. SONTVEDT 1007
"Diffusion controlled sea water corrosion of offshore pipelines under disbanded protecture coatings"

7. M. MIHELCIC, C. SCHROCK-PAULI, K. WINGERATH, H. WENZL, W. UELHOFF and A. VAN DER HART 1019
"Digital simulation of forced convection in a rotating fluid"

8. R.A. SKOP, M.L. MORRELL and G.A. KERAMIDAS 1031
"A comparison of explicit integration techniques for the advection equation"

9. S. PAOLUCCI and D.R. CHENOWETH 1045
"The effect of forced and free convection in the discharge of a pressurised gas"

10. L. ROBILLARD, P. VASSEUR and N.T. HUNG 1059
"Thermoconvective heat transfer in a rectangular cavity with constant wall cooling rate"

11. S.J.M. LINTHORST and C.J. HOOGENDOORN 1069
"Numerical calculation of the heat transfer by natural convection in a cubical enclosure"

12. P. LESAINT 1079
"Finite elements with upwinding for the diffusion-convection equation"

13. A. CAMPO and L.C. CHOW 1087
"Numerical solution for laminar forced convection in channels with combined wall suction and fluid axial conduction"

SECTION 9 NUMERICAL AND MATHEMATICAL CONCEPTS

1. J.J. PYUN 1099
"The second order particle-in-cell (PIC) computational method in the one-dimensional variable eulerian mesh system"

2. E.F. TORO and M.J. O'CARROL 1111
"On the nature of the stationary point in finite element determination of open channel flows"

3. M.M. GUPTA 1119
"A semi analytic method for viscous flows in the vicinity of singular corners"

4. M. LINDROOS 1129
"On a deferred convection procedure for determination of central difference solutions to the Navier-Stokes equations"

5. E.C.P. RANSOM,, J.H. BARNES and P.D. PHIPPS 1143
"An experimental investigation of the dispersion of a gas jet in a co-following stream of air"

6. G.A. KERAMIDAS and T.A. PAPATHEODOROU 1155
"Error and stability analysis of the finite element solution for the transport equation"

7. J. HAUSER, D. EPPEL nad F. TANZER 1165
"Solution of fluid flow problems by a direct spline interpolation method"

8. E-M. SALONEN, P. LEHTONEN and A. PRAMILA 1185
"Further u,v - formulations for ideal fluid flow"

9. N.L. KALTHIA 1197
"Numerical techniques in a wedge flow of a power law fluid"

10. S.D. BAJPAI 1211
"The use of Bessel function and JACOBI polynomial in radial vibrations of a gas in an infinite cylindrical tube"

11. M.K. KADALBAJOO and K.K. BHARADWAJ 1125
"Symmetric marching technique (SMT) for the efficient solution of discretised poisson equation on non-rectangular regions"

12. R. PEYRET and B. REBOURCET 1229
"Numerical study of a jet in a stratified fluid"

13. D. AUBRY and D. ZANDVLIET 1241
"Finite element analysis of mixed convection applied to the storage of solar energy"

14. W.G. HABASHI and P.L. KOTIUGA 1253
"Finite element solution of subsonic and transonic cascade flows"