

CONTENTS

| | | |
|----------|--|--------------|
| 1 | INTRODUCTION | 1-13 |
| | 1.1 Introduction | 1 |
| | 1.1.1 Boundary layer convection in vertical enclosures. | |
| | 1.1.2 Cellular convection in inclined enclosures under favourable temperature gradients. | |
| | 1.1.3 Cellular convection in inclined enclosures under adverse temperature gradients. | |
| | 1.2 Literature Survey | 4 |
| | 1.3 Present Investigation | 13 |
| 2 | ANALYSIS OF BASIC EQUATIONS | 14-19 |
| | 2.1 Introduction | 14 |
| | 2.2 Enclosure configuration | 14 |
| | 2.3 Boussinesq Approximation | 14 |
| | 2.4 Governing Equations | 16 |
| | 2.5 Boundary conditions | 18 |
| 3 | METHOD OF SOLUTION | 20-37 |
| | 3.1 Introduction | 20 |
| | 3.2 Finite Element Method (FEM) | 23 |
| | 3.2.1 FEM Applied to conduction problems. | |

| | | | |
|---|--------|--|---------|
| | 3.2.2 | Extension of FEM to convection problems. | |
| | 3.3 | Computational Algorithm | 36 |
| 4 | | DIGITAL COMPUTER SIMULATION | 38-65 |
| | 4.1 | Specifications of the computer used | 38 |
| | 4.2 | FORTRAN IV Computer Programme | 38 |
| | 4.3 | Selection of Important Parameters | 39 |
| | 4.3.1 | Selection of Boundary conditions. | |
| | 4.3.2 | Selection of number of elements. | |
| | 4.3.3 | Selection of Tolerance levels (sensitivity Analysis) | |
| | 4.3.4. | Study of Convergence and overflow conditions. | |
| | 4.3.5 | History of Central temperature. | |
| | 4.3.6 | Effect of Computing environment. | |
| | 4.4. | Computational Plan | 65 |
| 5 | | RESULTS AND DISCUSSION | 66-104 |
| | 5.1 | Documentation of Results | 66 |
| | 5.2 | Discussion of Results | 69 |
| 6 | | CONCLUSION | 105-108 |
| | 6.1 | Concluding Remarks | 105 |
| | 6.2 | Further Scope | 107 |
| R | | REFERENCES | 109-123 |

| | | |
|----------|---|----------------|
| A | APPENDICES | 124-376 |
| A-1 | Nomenclature | 124 |
| A-2 | Variable names used in the Programme | 127 |
| A-3 | Normalisation of governing equations | 135 |
| A-4 | Gauss-Seidel method of matrix iterations | 145 |
| A-5 | Flow Chart | 148 |
| A-6 | FORTRAN IV Programme Code | 154 |
| A-7 | Sample Computer Printouts | 162 |
| | | |
| P | PAPERS PUBLISHED | 377-387 |
| P-1 | Paper presented at the Ninth National Heat and Mass Transfer Conference, Bangalore, Dec.1987. | 377 |
| P-2 | Paper presented at the eighth National Heat and Mass Transfer Conference, Visakhapatnam, Dec.1985. | 384 |
| | | |
| S | SUPPLEMENTS | |
| S-1 | Computer printouts of INCONIX 4000 | |
| S-2 | Computer Printouts of IBM-360 | |
| S-3 | FORTRAN IV Programme codes with subroutines. | |

NOTE SUPPLEMENTS ARE APPENDED ONLY WITH THE ORIGINAL
COPY, FOR RECORD.