

| | Page |
|---|------|
| CONTENTS | |
| FOREWORD | |
| AIMS AND WORKING SUGGESTIONS | vii |
| Chap. | |
| 1 DEFINITION OF STATICALLY INDETERMINATE STRUCTURES | |
| STATICALLY DETERMINATE STRUCTURES | |
| STATICALLY INDETERMINATE STRUCTURES | 3 |
| POINTS OF DIFFERENCE BETWEEN THE TWO TYPES | 3 |
| 2 METHOD OF AREA MOMENTS | |
| Principle of Area Moments | 4 |
| Procedure | 5 |
| Convention of Signs (1) | 5 |
| SIMPLE BEAMS | 6 |
| THEOREM OF THREE MOMENTS | 17 |
| BEAM WITH APPLIED MOMENT | 33 |
| 3 METHOD OF STRAIN ENERGY | |
| General Principles | 35 |
| BEAMS AND FRAMES HAVING ONE REDUNDANT REACTION | 36 |
| BEAMS AND FRAMES HAVING MORE THAN ONE REDUNDANCY | 46 |
| FRAMES WITH SLOPING OR CURVED MEMBERS | 50 |
| MULTI-SPAN, MULTI-STOREY, VIERENDEEL AND CIRCULAR FRAMES | 55 |
| 4. TWO-HINGED AND FIXED ARCHES | |
| Significance of the Arch Profile | 69 |
| TWO-HINGED ARCHES | 69 |
| Segmental Arches | 72 |
| Varying Moment of Inertia | 76 |
| Parabolic Arches | 78 |
| Thrust and Shear | 83 |
| Temperature Thrust | 86 |
| Rib-shortening | 86 |
| FIXED ARCHES | 90 |
| The Elastic Centre | 94 |

| | | |
|-------|--|-----|
| Chap. | | |
| 5 | METHOD OF SLOPE DEFLECTION | |
| | Slope Deflection Equations | 99 |
| | Convention of Signs (2) | 99 |
| | SIMPLE BEAMS WITH SETTLEMENT OF SUPPORTS | 102 |
| | PORTAL AND BUILDING FRAMES | 107 |
| | FRAMES WITH SETTLEMENT OF FOUNDATIONS | 124 |
| 6 | METHOD OF MOMENT DISTRIBUTION | |
| | Basic Assumptions | 130 |
| | Convention of Signs (2) | 131 |
| | CONTINUOUS BEAMS | |
| | Fundamental Stages in the Method | 132 |
| | Simplified Procedure for Free Ends | 134 |
| | PORTAL AND BUILDING FRAMES WITHOUT SIDESWAY | 138 |
| | PORTAL AND BUILDING FRAMES WITH SIDESWAY | 142 |
| | Correcting Moments | 142 |
| | PORTAL AND BUILDING FRAMES WITH LATERAL LOADING | 161 |
| | FRAMES WITH SLOPING MEMBERS | 170 |
| 7 | THE COLUMN ANALOGY | |
| | Equations for a Bent Beam | |
| | Equations for a Short Column eccentrically loaded | 175 |
| | Convention of Signs (3) | 176 |
| | BEAMS | 177 |
| | PORTAL FRAMES | 184 |
| | UNSYMMETRICAL FRAMES | 192 |
| | Stress at any Point in a Column Cross-section | 192 |
| 8 | INFLUENCE LINES FOR CONTINUOUS STRUCTURES | |
| | Application of Maxwell's Theorem of Reciprocal Displacements | |
| | INFLUENCE LINES FOR STATICALLY INDETERMINATE BEAMS | |
| | INFLUENCE LINES FOR TWO-HINGED AND FIXED PORTALS | |
| | INFLUENCE LINES FOR TWO-HINGED AND FIXED ARCHES | |

| Chap. | | Page |
|-------|---|------|
| 9 | PIN-JOINTED STRUCTURES WITH REDUNDANT MEMBERS | |
| | Procedure | 237 |
| | FRAMES WITH ONE OR TWO REDUNDANCIES | 238 |
| | LACK OF FIT | 250 |
| | REDUNDANT REACTIONS AND THE EFFECT OF VARIATION IN CROSS-SECTIONAL AREA | 252 |
| | THE TRUSSED BEAM | 257 |
| 10 | MODEL ANALYSIS | |
| | MODELS OF PINNED AND FIXED-END BEAMS | 262 |
| | MODELS OF PORTAL FRAMES | 264 |
| | Intercepts | 265 |
| | Varying Second Moment of Area | 265 |
| | Internal Forces and Moments | 266 |
| | Pictorial Index | 267 |
| | Appendix | 269 |