



# CONTENTS

## I. ORDINARY DIFFERENTIAL EQUATIONS

1. Ordinary differential equations and finite differences	L. FOX	3
2. Methods of Runge-Kutta type	D. F. MAYERS	16
3. Prediction and correction: Deferred correction	D. F. MAYERS	28
4. Stability of step-by-step methods	D. F. MAYERS	46
5. Boundary-value problems and methods	L. FOX	58
6. Eigenvalue problems	D. F. MAYERS	73
7. Application to the one-dimensional Schrödinger equation	D. F. MAYERS	87
8. Accuracy and precision of methods	L. FOX	95
9. Chebyshev approximation	L. FOX	113
10. Chebyshev solution of ordinary differential equations	L. FOX	129

## II. INTEGRAL EQUATIONS

11. Fredholm equations of second kind	D. F. MAYERS	145
12. Fredholm equations of first and third kinds	D. F. MAYERS	154
13. Equations of Volterra type	D. F. MAYERS	165
14. Singular and non-linear integral equations	D. F. MAYERS	174
15. Integro-differential equations in nuclear collision problems	R. A. BUCKINGHAM	184
16. Roothaan's procedure for solving the Hartree-Fock equation	M. J. D. POWELL	197

## III. INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

17. General classification. Hyperbolic equations and characteristics	L. FOX	205
18. Finite-difference methods for hyperbolic equations	L. FOX	218
19. Parabolic equations in two dimensions: I	L. FOX	230
20. Parabolic equations in two dimensions: II	L. FOX	242
21. Finite-difference formulae for elliptic equations in two dimensions	L. FOX	255
22. Direct solution of elliptic finite-difference equations	J. E. WALSH	272
23. Iterative solution of elliptic finite-difference equations	L. FOX	284
24. Singularities in elliptic equations	L. FOX	301

## IV. PRACTICAL PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS

25. Elliptic equations in nuclear reactor problems	J. E. WALSH	315
26. Solution by characteristics of the equations of one-dimensional unsteady flow	A. E. GLENNIE	325
27. Finite-difference methods for one-dimensional unsteady flow	N. E. HOSKIN and B. W. PEARSON	339
28. Characteristics in three independent variables	D. S. BUTLER	366
29. Quasi-linear parabolic equations in more than two dimensions: I	A. R. CURTIS	378
30. Quasi-linear parabolic equations in more than two dimensions: II	A. R. CURTIS	388
31. The linear transport equation in one and two dimensions	L. H. UNDERHILL and L. M. RUSSELL	398
32. Monte Carlo methods for neutronics problems	J. B. PARKER	423
33. Special techniques of the Monte Carlo method	I. C. PULL	442
34. Some problems in plasma physics	I. C. PYLE	458
35. Self-consistent solutions of a non-linear problem in plasma physics	H. MOTZ	469
36. Numerical weather prediction	E. KNIGHTING	478
REFERENCES		494
INDEX		502

