

| | | |
|-----------------|-----|-------|
| <i>Preface</i> | ... | (vii) |
| <i>Syllabus</i> | ... | (ix) |

Module I

| | | |
|--|-----|-------------|
| CHAPTER 1. Introduction to Propositional Calculus | | 1–54 |
| 1.1 Introduction | ... | 1 |
| 1.2 Five basic Connectives | ... | 2 |
| 1.3 Statement Formulas and Truth Tables | ... | 6 |
| 1.4 Tautology and Contradiction | ... | 6 |
| 1.5 Equivalence of Formulas | ... | 7 |
| 1.6 Equivalent Formulas or Logical Equivalences | ... | 8 |
| 1.7 Normal Forms : DNF and CNF | ... | 10 |
| 1.8 Tautological Implication | ... | 13 |
| 1.9 Valid Arguments | ... | 13 |
| 1.10 Predicates | ... | 19 |
| 1.11 Quantifications | ... | 20 |
| 1.12 Negation of a Quantified Statement Function | ... | 22 |
| 1.13 Free and Bound Variables | ... | 23 |
| 1.14 Rules of Inference for Quantified Statements | ... | 24 |
| <i>Multiple Choice Questions</i> | ... | 47 |
| <i>Short Answer Questions</i> | ... | 50 |
| <i>Problems</i> | ... | 52 |

Module II

| | | |
|--|-----|--------------|
| CHAPTER 2. Theory of Numbers | | 55–89 |
| 2.1 Introduction | ... | 55 |
| 2.2 Principle of Mathematical Induction | ... | 55 |
| 2.3 Divisibility Theory | ... | 57 |
| 2.4 Euclidean Algorithm for Finding $\gcd(a, b)$ | ... | 62 |
| 2.5 Prime Numbers | ... | 63 |
| <i>Miscellaneous Examples</i> | ... | 66 |

| | | | |
|-----|----------------------------------|-----|----|
| 2.6 | Congruences | ... | 70 |
| 2.7 | Applications of Congruences | ... | 77 |
| 2.8 | Residue Classes | ... | 79 |
| 2.9 | Linear Congruences | ... | 81 |
| | <i>Multiple Choice Questions</i> | ... | 85 |
| | <i>Problems</i> | ... | 88 |

Module II

| | |
|---------------------------------------|---------------|
| CHAPTER 3. Posets and Lattices | 90–114 |
| 3.1 Partial Ordering Relations | ... |
| 3.2 Partially Ordered Set (POSet) | ... |
| 3.3 Lattices | ... |
| 3.4 Sublattices | ... |
| 3.5 Some special Lattices | ... |
| <i>Multiple Choice Questions</i> | ... |
| <i>Problems</i> | ... |

Module III

| | |
|---|----------------|
| CHAPTER 4. Combinatorics | 115–166 |
| 4.1 Introduction | ... |
| 4.2 Two Basic Principles of Counting | ... |
| 4.3 Permutations and Combinations | ... |
| <i>Illustrative Examples–I</i> | ... |
| <i>Illustrative Examples–II</i> | ... |
| 4.4 The Pigeonhole Principle | ... |
| 4.5 The Principle of Inclusion and Exclusion | ... |
| 4.6 An Alternative Form of the Principle of Inclusion and Exclusion | ... |
| 4.7 The Number of Onto Functions | ... |
| 4.8 Derangements | ... |
| <i>Illustrative Examples–III</i> | ... |
| <i>Exercise—4A</i> | ... |
| <i>Multiple Choice Questions</i> | ... |
| <i>Exercise—4B</i> | ... |

Module III

| | |
|--|----------------|
| CHAPTER 5. Recurrence Relations | 167–199 |
| 5.1 Introduction | ... |
| 5.2 Recurrence Relation and its Solution | ... |
| 5.3 Formulation (or modelling) of Different Counting Problems in Terms of Recurrence Relations | ... |
| 5.4 Linear Recurrence Relation with Constant Coefficients | ... |
| 5.5 Solution of Linear Recurrence Relations with Constant Coefficients by Iterative Method | ... |
| <i>Illustrative Examples–I</i> | ... |

| | | | |
|-----|--|-----|-----|
| 5.6 | Solution of Linear Recurrence Relations with Constant Coefficients by Characteristic Roots Method | ... | 175 |
| | <i>Illustrative Examples-II</i> | ... | 177 |
| | <i>Illustrative Examples-III</i> | ... | 179 |
| 5.7 | Solution of Linear Recurrence Relations with Constant Coefficients by Generating Functions Method | ... | 184 |
| | <i>Illustrative Examples-IV</i> | ... | 186 |
| | <i>Multiple Choice Questions</i> | ... | 193 |
| | <i>Problems</i> | ... | 195 |

Module IV

| | | | |
|-------------------|--|-----|----------------|
| CHAPTER 6. | Graph Colouring | | 200–234 |
| 6.1 | Chromatic Number | ... | 200 |
| 6.2 | Chromatic Number of a Complete Graph (K_n) | ... | 202 |
| 6.3 | Chromatic Number of a Circuit (C_n) | ... | 204 |
| 6.4 | Chromatic Number of a Bipartite Graph ($K_{m, n}$) | ... | 206 |
| 6.5 | Upper Bounds of Chromatic Numbers | ... | 207 |
| 6.6 | Rules for Finding Chromatic Number of a Graph G | ... | 209 |
| 6.7 | Lower Bounds of Chromatic Numbers | ... | 210 |
| 6.8 | Perfect Graph | ... | 214 |
| 6.9 | Chromatic Polynomial | ... | 215 |
| 6.10 | Four and Five Colour Theorems | ... | 218 |
| 6.11 | Applications of Graph Colourings | ... | 220 |
| | <i>Miscellaneous Examples</i> | ... | 221 |
| | <i>Multiple Choice Questions</i> | ... | 228 |
| | <i>Problems</i> | ... | 233 |

Module IV

| | | | |
|-------------------|---|-----|----------------|
| CHAPTER 7. | Matchings | | 235–246 |
| 7.1 | Introduction | ... | 235 |
| 7.2 | Matchings: Definitions | ... | 236 |
| 7.3 | Perfect Matchings | ... | 237 |
| 7.4 | Matchings in Bipartite Graphs | ... | 238 |
| 7.5 | Matrix Method for Finding Perfect (or, Complete) Matching | ... | 239 |
| 7.6 | Hall's Marriage Theorem | ... | 241 |
| | <i>Exercises</i> | ... | 244 |

| | |
|--------------------------|----------------|
| EXAMINATION PAPER | 247–250 |
|--------------------------|----------------|

| | |
|--------------|----------------|
| INDEX | 251–254 |
|--------------|----------------|