

Contents

| | |
|--|-----------|
| CHAPTER I | |
| Populations That Are Not Age-Dependent | 1 |
| 1.1 Mathematical Concepts | 1 |
| Population Models. Rates of Growth. Exponential and Logistic Models. Matrices and Graphs in Demography. | |
| 1.2. Problems | 5 |
| Exercises Based on Mathematical Concepts, U.S. and World Population Figures. | |
| 1.3. Solutions | 12 |
| CHAPTER II | |
| The Life Table | 26 |
| 2.1. Mathematical Concepts | 26 |
| Basic Functions and Their Relations. Force of Mortality. Models for Numbers of Lives. Adjusted Death Rates. Stationary Population Models. | |
| 2.2. Problems | 31 |
| Central Death Rate Problems. De Moivre, Uniform, and Balducci Distributions of Deaths. Constant Force of Mortality. Elimination of a Cause of Death. Exercises on Life Table Functions. Effects of Mortality Reductions. Force of Mortality and Expectation of Life. Laws of Gompertz, Makeham, and Weibull. | |
| 2.3. Solutions | 40 |
| CHAPTER III | |
| Uses of Stable Theory | 55 |
| Stable Age Distribution. Effects of Birth and Death Rates. Uses of Moments of the Age Distribution. Characteristic Equation in Unknown r . | |

| | |
|---|-----|
| 3.1. Problems | 56 |
| Stable Age Distribution Questions. Filling Gaps in Data. Departure of the Assumptions. Analysis of Age Distributions. Periods and Cohorts. | |
| 3.2. Solutions | 61 |
| CHAPTER IV | |
| Births and Deaths Under Stability | 78 |
| 4.1. Problems | 78 |
| Approximate Solution to Characteristic Equation. Length of Generation. Composite of Stable Subpopulations. | |
| 4.2. Solutions | 81 |
| CHAPTER V | |
| Projection and Forecasting | 93 |
| 5.1. Problems | 93 |
| Extrapolation of Population Totals. Matrix Technique. Analysis of the Projection Matrix. Breakdown by Sex and Other Attributes. | |
| 5.2. Solutions | 97 |
| CHAPTER VI | |
| Stochastic Population Models | 110 |
| 6.1. Needed Concepts | 110 |
| Probabilistic Framework. Random Variables. Mean Value and Variance. Discrete and Continuous Distributions. Generating Functions. Independence. Sums of Random Variables. Central Limit Theorem. | |
| 6.2. Problems | 115 |
| Family Size Exercises. Probability of Extinction. Expected Number of Direct Descendents. Distribution of Sizes of Completed Families. Parity Progression Ratio. Rural–Urban Shifts and Markov Chains. Ergodic Theorems for Markov Chains and Demography. Birth and Death Stochastic Processes. Population Estimates and Loss Functions. | |
| 6.3. Solutions | 124 |
| Brief List of References | 135 |
| Index | 137 |