

McGRAW-HILL INTERNATIONAL EDITION

# **Contents**

Preface ix	Chapter <b>3</b>			
Chapter 1	Nominal and Effective Interest Rates 59 3.1 Nominal and Effective Interest Rate			
Foundations of Engineering Economy 1  1.1 What is Engineering Economy? 3  1.2 Performing an Engineering Economy Study 3  1.3 Interest Rate, Rate of Return, and MARR 5  1.4 Equivalence 8  1.5 Simple and Compound Interest 9  1.6 Terminology and Symbols 14  1.7 Cash Flows: Their Estimation and Diagramming 16  1.8 The Rule of 72 20  1.9 Introduction to Using Spreadsheet Functions 21; Summary 23  Problems 23  Problems for Test Review and FE Exam Practice 25	<ul> <li>Statements 61</li> <li>3.2 Effective Interest Rate Formulation 63</li> <li>3.3 Reconciling Compounding Periods and Payment Periods 65</li> <li>3.4 Equivalence Calculations Involving Only Single-Amount Factors 66</li> <li>3.5 Equivalence Calculations Involving Series with PP ≥ CP 68</li> <li>3.6 Equivalence Calculations Involving Series with PP &lt; CP 70</li> <li>3.7 Using Spreadsheets for Effective Interest Rate Computations 72</li> <li>Summary 74</li> <li>Problems 74</li> <li>Problems for Test Review and FE Exam Practice 78</li> </ul>			
Chapter 2	Chapter 4			
Factors: How Time and Interest Affect Money 27	Present Worth Analysis 80			
<ul> <li>2.1 Single-Payment Formulas (F/P and P/F) 29</li> <li>2.2 Uniform Series Formulas (P/A, A/P, A/F, F/A) 34</li> <li>2.3 Gradient Formulas 37</li> <li>2.4 Calculations for Cash Flows That are Shifted 41</li> <li>2.5 Using Spreadsheets for Equivalency Computations 45</li> <li>Summary 49</li> <li>Problems 50</li> </ul>	<ul> <li>4.1 Formulating Alternatives 82</li> <li>4.2 Present Worth Analysis of Equal-Life Alternatives 84</li> <li>4.3 Present Worth Analysis of Different-Life Alternatives 86</li> <li>4.4 Capitalized Cost Analysis 89</li> <li>4.5 Evaluation of Independent Projects 94</li> <li>4.6 Using Spreadsheets for PW Analysis 96</li> <li>Summary 98</li> <li>Problems 99</li> </ul>			
Problems for Test Review and FE Eyam	Problems for Test Review and FE Exam			

Practice 105

Practice 57

Chapter	Ð
O LIGOTO I	

#### Annual Worth Analysis 107

- 5.1 AW Value Calculations 109
- **5.2** Evaluating Alternatives Based on Annual Worth 112
- 5.3 AW of a Permanent Investment 114
- 5.4 Using Spreadsheets for AW Analysis 116

Summary 118

Problems 119

Problems for Test Review and FE Exam

Practice 122

## Chapter 6

### Rate of Return Analysis 124

- 6.1 Interpretation of ROR Values 126
- 6.2 ROR Calculation 128
- 6.3 Cautions when Using the ROR Method 131
- **6.4** Understanding Incremental ROR Analysis 131
- **6.5** ROR Evaluation of Two or More Mutually Exclusive Alternatives 135
- 6.6 Multiple ROR Values 139
- 6.7 Removing Multiple ROR Values by Using a Reinvestment Rate 143
- **6.8** Using Spreadsheets for ROR Analysis 147

Summary 151

Problems 151

Problems for Test Review and FE Exam

Practice 158

# Chapter

### Benefit/Cost Analysis and Public Sector Projects 160

- 7.1 Public Versus Private Sector Projects 162
- **7.2** Benefit/Cost Analysis of a Single Project 166
- **7.3** Incremental B/C Evaluation of Two or More Alternatives 168

7.4 Using Spreadsheets for B/C Analysis 174

Summary 176

Problems 176

Problems for Test Review and FE Exam

Practice 180

## Chapter

# Breakeven, Sensitivity, and Payback Analysis 182

8

- 8.1 Breakeven Analysis for a Single Project 184
- 8.2 Breakeven Analysis Between Two Alternatives 189
- 8.3 Sensitivity Analysis for Variation in Estimates 192
- 8.4 Sensitivity Analysis of Multiple Parameters for Multiple Alternatives 197
- 8.5 Payback Period Analysis 199
- **8.6** Using Spreadsheets for Sensitivity or Breakeven Analysis 201

Summary 205

Problems 206

Problems for Test Review and FE Exam

Practice 213

### Chapter **(**

### Replacement and Retention Decisions 215

- 9.1 Basics of a Replacement Study 217
- 9.2 Economic Service Life 218
- 9.3 Performing a Replacement Study 220
- 9.4 Defender Replacement Value 224
- 9.5 Replacement Study Over a Specified Study Period 224
- 9.6 Using Spreadsheets for a Replacement Study 228

Summary 231

Problems 232

Problems for Test Review and FE Exam

Practice 235

# Chapter 10

Fifects of Inflation 2	37	•
------------------------	----	---

101	Understanding	the	<b>Impact</b>	of	Inflation	239

- 10.2 PW Calculations Adjusted for Inflation 241
- 10.3 FW Calculations Adjusted for Inflation 246
- 10.4 AW Calculations Adjusted for Inflation 250
- 10.5 Using Spreadsheets to Adjust for Inflation 252

Summary 253

Problems 254

Problems for Test Review and FE Exam

Practice 257

# Chapter 11

### **Estimating Costs 259**

- 11.1 How Cost Estimates Are Made 261
- 11.2 Unit Method 264
- **11.3** Cost Indexes 266
- **11.4** Cost-Estimating Relationships: Cost-Capacity Equations 269
- 11.5 Cost-Estimating Relationships: Factor Method 271
- **11.6** Cost-Estimating Relationships: Learning Curve 273
- 11.7 Indirect Cost (Overhead) Estimation and Allocation 275

Summary 281

Problems 282

Problems for Test Review and FE Exam

Practice 285

# Chapter 12

### **Depreciation Methods 28**

- 12.1 Depreciation Terminology 289
- 12.2 Straight Line (SL) Depreciation 291
- 12.3 Declining Balance Depreciation 292
- 12.4 Modified Accelerated Cost Recovery System (MACRS) 295

- 12.5 Switching Between Classical Methods; Relation to MACRS Rates 299
- 12.6 Depletion Methods 301
- **12.7** Using Spreadsheets for Depreciation Computations 303

Summary 306

Problems 307

Problems for Test Review and FE Exam

Practice 310

# Chapter 13

#### After-Tax Economic Analysis 312

- **13.1** Income Tax Terminology and Relations 314
- **13.2** Before-Tax and After-Tax Alternative Evaluation 317
- **13.3** How Depreciation Can Affect an After-Tax Study 320
- 13.4 After-Tax Replacement Study 326
- 13.5 Capital Funds and the Cost of Capital 328
- **13.6** Using Spreadsheets for After-Tax Evaluation 332
- 13.7 After-Tax Value-Added Analysis 335
- **13.8** Tax Considerations for International Projects 337

Summary 339

Problems 340

Problems for Test Review and FE Exam

Practice 346

## Appendix **A**

# Using Spreadsheets and Microsoft Excel® 348

- A.1 Introduction to Using Excel 348
- A.2 Organization (Layout) of the Spreadsheet 351
- **A.3** Excel Functions Important to Engineering Economy 353
- A.4 GOAL SEEK—A Simple Tool for Breakeven and Sensitivity Analyses 361
- A.5 Error Messages 362

### **Appendix**

### **Accounting Reports and Business Ratios 363**

- **B.1** The Balance Sheet 363
- **B.2** Income Statement and Cost of Goods Sold Statement 364
- **B.3** Business Ratios 366

## **Appendix**

### **Alternative Evaluation that Includes Multiple** Attributes and Risk 370

- **C.1** Multiple Attribute Analysis 370
- **C.2** Economic Evaluation with Risk Considered 376

### **Appendix**

Answers to Problems for Test Review and FE Exam Practice 385

Reference Materials 386 Interest Factor Tables 388 Index 414