Table of Content

Chapter 1 Getting Started with Your MATLAB……1

Introduction……1
Evaluation Mathematical Expressions……3
Basic Mathematical Operation……4
Character Strings……6
More You Should Know……8
Build-in Math Functions & Variables……9
Rounding to Integers……12
Base Conversions……13
Commands & Help……14
Generation of Vectors……17
Complex Numbers……23
Polynomials……28
Plotting & Graphics……34
MATLAB Files……58
Creating Your Own Functions……63
Additional MATLAB Commands……63
Formatted Output……65
Loops & Control……69
Curve Fitting……79
Interpolation……83
Saving & Loading of Data……84

Chapter 2 Matrix Operation……86

Introduction……86
Building Large Matrices……87
Special Matrices……90
The Empty Matrix……94
Matrix Operations……94
Determinant of a Matrix……98
Rank of a Matrix……99
Inverse of Matrix……100
Transpose of a matrix……101
Symmetric Matrix……102

Trace of a matrix……..103
Additional Properties of Matrices……...103
Eigenvalues & Eigenvectors……103
Solving Systems of Linear Equations……104
Cramer's Rule……..106

Chapter 3 Linear System Analysis……...107
Introduction……107
Basic Discrete-time Sequences……..107
Periodic Signals……...110
Square, Sawtooth & Sinusoidal Waves……110
Circle……112
Periodic Signal Generator for Time Response Simulations……112
Signal Energy……..113
Convolution……113
Sequence Folding……116
Ordinary Differential Equation (ODE)……117
Transfer Function……...121
Step Response & Impulse Response……124
Pole-zero Plots……129
The Z-Plane……130
Stability Design via Routh-Hurwitz……..133
Partial-fraction Expansion……133
Power Series Expansion with MATLAB……..140
Bode Plots……141
Interconnection of Systems……144
Frequency Response Plots……148
Fourier Synthesis……152
The Discrete Time Fourier Transform……154
The Discrete Fourier Transform (DFT)……...155
Timing……..160
Zero-Padding……..161
The Discrete-Time Fourier Series (DTFS)……...162
Circular Convolution……163
DTMF (Multi-tone Dialing Procedure)……163
Telephone Tones……..164
DTMF Decoder……...165
Speech Processing……...167

The Spectrogram……170
Chirp Signals……..171
Goertzel Algorithm……174
Quantization……...175
Zero-crossings……177
Audio Effects……..178

Chapter 4 Symbolic Toolbox……180
Introduction……180
Plotting……181
Partial Fraction Expansion……...183
Differentiation……183
Integration……...186
Limits……...188
Symbolic Algebra……189
Solving Algebraic Equations……191
Fourier Transformation……195
Laplace Transformation……196
Z Transform……198
Taylor Series……200
MATRICES……202
Symbolic Differential Equation…….....203
Systems of Linear Differential Equations……205

Chapter 5 Design & Analysis of Analog & Digital Filters……..208
Analog Filter Design……...208
Normalized Lowpass Analog Filters……209
Frequency Response of Analog Filters……212
Frequency Transformations……..213
Digital Filter Design……...217
Filter Realization Wizard……..268
MATLAB Filter……..269
MATLAB impz……...270

Chapter 6 Random Signals……...272
Introduction……272
Random Number Generation……272
Randomization……274

Bar Graphs……275
Scatter Diagrams & Correction Coefficient……...276
Mean, Standard Deviation & Median……279
Gaussian Probabilities……280
White Noise……...281
Some Useful Functions……282
Spinning Coins……283
The Cumsum Function……286
Counting Techniques……286
Evaluation of Binomial Coefficients……...287
Correlation……290
Power Spectral Density……293
Signal-to-Noise Ratio……294

Chapter 7 Graphical User Interface with MATLAB……295
How to get started?.....295
Got a "Guide Quick Start" Window?.....296
A New Untitle Window……296
Component Palette……297
Let's Start Making a Simple GUI……298
How to Launch GUI……...312

Chapter 8 Simulink Tutorial……313
Introduction……313
Starting Up Simulink……313
Basic Elements……315
Tutorial-1……316
Tutorial-2……324