Index

A

Algebraic Lyapunov Equation *pp.*80 – 82
Arrow Matrix *pp.*150 – 154
Asymptotically Stable *pp.*7, 61 – 62, 67 – 69, 75
Attractiveness *pp.*61, 99

B

Bendixson's Theorem *pp.*25 – 29
Bifurcation *pp.*12 – 13
Bifurcation (Fold) *pp.*12 – 13, 57
Bifurcation (Transcritical) *pp.*12 – 15
Bifurcation Diagram *pp.*12, 15 – 17

C

Carrying Capacity *p.*9
Center Manifold Theory *pp.*39 – 45
Centers (Equilibrium Point) *pp.*22, 26
Characteristic Equation *p.*34
Class K (Comparison Functions) *pp.*93 – 97, 102 – 112
Class K L (Comparison Functions) *pp.*93 – 97, 102 – 112
Class K_∞ (Comparison Functions) *pp.*93 – 96, 105
Comparison Function *pp.*93 – 96, 102 – 103
Continuity w.r.t. Initial Conditions *pp.*53 – 55
Continuity w.r.t. Parameters *pp.*54 – 55
Continuously Differentiable *pp.*48 – 52
Control Lyapunov Function *pp.*167, 179 – 180
Controllability Gramian *p.*80
Coordinate Transformation Matrix *pp.*18, 20 – 41

D

Diagonalization *p.*79
Diffeomorphic *p.*196
Differentiable *pp.*51 – 52
Differential Lyapunov Equation *pp.*121 – 122, 128
Divergence *pp.*25 – 29

E

Equilibrium Point *pp.*3 – 4
Estimation of Constant Parameters *pp.*130 – 149
Existence And Uniqueness Theorem *pp.*46 – 52, 91
Exponential Stability *pp.*103 – 104, 107, 116 – 123, 168

F

Feedback Linearization *pp.*185, 194
Finite Escape Time *pp.*9 – 10
Focus Node *pp.*22, 33
Fold Bifurcation *pp.*12 – 13, 57

G

Geometric Series *p.*92
Globally Asymptotically Stable *pp.*62, 67

Green's Theorem $pp.25-27$

H

Hartman Grobman Theorem $pp.23-24$
Homeomorphic $p.23$
Hopf Bifurcation $pp.35-38$
Huber Function $p.71$
Hurwitz Matrix $pp.81-82$
Hyperbolic Equilibrium Point $pp.22-24$

I

Index Theory $p.35$
Infinity Norm $p.61$
Input Output Linearization $pp.185-187, 190-191, 197-199$
Integrator Backstepping $pp.165-178$
Invariant Manifold $pp.42-45, 191-192$
Invariant Set $pp.74-77$
Inverted Pendulum $pp.192-194$

J

Jacobian $pp.56-58$

L

L1 Norm $p.61$
L2 Norm $p.61$
La Salle's Invariance Principle $pp.74-77, 85-87$
Level Sets $pp.66-69$
Lie Derivative $pp.179-184$
Limit Cycle $pp.10-12, 33-38$
Linearization at a Fixed Point $pp.5-8, 23-24, 88$
Lipschitz Continuous Function $pp.49-55, 91$
Locally Asymptotically Stable $pp.61-62, 67-69$
Logistic Equation $p.9$
Lorenz Attractor $p.12$
Lyapunov Functions $pp.65-87$
Lyapunov Stability $pp.59-69, 106-121$

M

Manifolds, C^k Differentiable $pp.48-52$
Markov Parameters $pp.188-190$
Metzler Matrix $p.31$
Minima Phase Transfer Function $pp.194-195$
Model Reference Adaptive Control $pp.154-165$

N

Negative Semidefinite Function $pp.67, 74-162$
Nesterov Acceleration $p.98$
Node $pp.21, 33$
Normal Form $pp.195-200$

O

Observability $pp.86-87, 127, 130, 138-141$
Observability Gramian $pp.80, 129$
Observer Based Controller $pp.135-136$

P

P Norm *p.*61
Pendulum *pp.*7 – 8, 63 – 64, 72 – 77
Periodic Orbits *pp.*25 – 34
Phase Portrait *pp.*5, 17 – 19
Pitchfork Bifurcation *pp.*12, 15 – 17
Poincare Bendixson Criterion *pp.*32 – 34
Positive Definite Function *pp.*65 – 66
Positive Definite Matrix *pp.*78 – 79
Positive Invariant Set *pp.*21, 29 – 34, 69
Positive System *p.*31
Predator/prey Model *pp.*30 – 31

R

Radially Unbounded *pp.*67 – 68, 105 – 107
Reference Signal Tracking *pp.*177 – 178, 183, 199 – 200
Region of Attraction *pp.*15, 92 – 93
Relative Degree *pp.*181 – 193
Routh Hurwitz Criterion *pp.*34, 83

S

Saddle Node *pp.*19 – 21
Sector Bounded Nonlinearities *p.*72
Sensitivity Function *pp.*55 – 58
Sink Node *pp.*19, 21
Sontag's Formula *p.*180
Source Node *pp.*19, 21
Stability *pp.*5, 98 – 103
Stability Via Linearization *pp.*88 – 90
Stable *p.*5
State Transition Matrix *pp.*105 – 106, 121 – 123
Subcritical Hopf Bifurcation *pp.*37 – 38
Subcritical Pitchfork Bifurcation *p.*17
Supercritical Hopf Bifurcation *pp.*35 – 37
Supercritical Pitchfork Bifurcation *pp.*15 – 16
Symmetric Matrix *p.*78

T

Taylor Series Expansion *pp.*6, 39 – 40, 44 – 45
Transcritical Bifurcation *pp.*12 – 15

U

Uniform Observability *pp.*129 – 130, 138 – 143
Uniformly Asymptotically Stable *pp.*100 – 104, 107 – 116
Uniformly Exponentially Stable *pp.*103 – 104, 107, 116 – 123
Uniformly Stable *pp.*100 – 102, 104, 107 – 114
Unitary Diagonal Coordinate Transformation *p.*79

V

Van Der Pol Oscillator *pp.*11 – 12

Z

Zero Dynamics *pp.*181 – 182, 185, 193 – 195