Index

Symbols

*-Algebra, 17
3-Colored digraph, 61

A
Adjacency matrix, 1
Approximation numbers, 144
Archimedean copulas, 69
Artinian ring, 178

B
Best linear unbiased estimator, 74
Best linear unbiased estimators, 85
Best quadratic unbiased estimators, 86
Block diagonalization, 13
BLUE, 74, 85
Boolean algebra, 15
Bounded linear operator, 144
BQUE, 86
Brhat Samhitā, 229

C
Closed range operator, 156
Column space, 196
Commutant, 13
Commutative Jordan algebras, 86
Condition number, 160
Copula density, 69
Copula model, 63
Copula parameter, 64
Copulas; Archimedean, 69
Correlation matrix, 66
Covariance matrix, 73, 85
Cramer’s rule, 183
Cycle; non-singular, 59
Cycle; singular, 59

D
Daivajna Varāhamihira, 229
Degree partition, 50
Descending chain condition, 177
Diagonalization, 13
Digraph; 3-colored, 61
Direct sum, 197
Directed along, 59
Directed opposite, 59
Disjoint matrices, 197
Dispersion matrix, 66
DL of incline, 184
Dominant partial order, 199
Down operator, 14
Drazin inverse, 177

E
Elliptical distributions, 63
Equivalence relation, 198
Error Orthogonal Models, 85
Estimable vector, 85
Euclidean domain, 172
Extended partial order, 198

F
Fredholm operator, 156
Fundamental BLUE equation, 75
Fuzzy algebra, 184
Fuzzy matrices, 184

G
G-inverse, 197
Generalized inverse, 74
GH path, 42
Graded Jordan chain, 15
Graph, 1
Graph energy, 8
Graph factor, 44
Graph; non-singular, 59
Graph; oriented, 1
Graph; regular, 34
Graph; singular, 59
Graph; undirected, 1
Graphical matrix, 42
Greatest lower bound, 199
Group action, 13
Group inverse, 136

H
Hat matrix, 112
Hermitian, 196
Homoscedastic sub-models, 86
Hypercube, 2

I
Idempotent, 102, 197
Idempotent matrices property, 172
Ihara–Selberg zeta function, 34
Immanant, 34
Immanant; second, 34
Immanant; third, 34
Incline, 183
Indefinite inner product, 133
Indefinite matrix multiplication, 134
Index, 178
Infimum, 199
Integral domain, 172

J
J-EP matrix, 136
J-Invertible, 136
Jacobi–Trudi identity, 35
Jordan algebra, 86
Jordan basis, 15

L
Laplace distribution, 64
Laplacian matrix, 58
Lattice, 199
Least square estimator, 85
Least squares estimator, 75
Least upper bound, 199
Left perfect ring, 177
Level-2 condition number, 163
Linear mapping, 196
Linear model, 73
Linear regression model, 111
Linear unbiased estimator, 74
Linearly ordered, 186
Löwner partial order, 200
Lower bound, 199

M
Magic Perfume, 229
Magic square, 228
Matrix Product of Graphs, 44
Matrix-Tree Theorem, 39
Maximal, 199
Minimal, 199
Minkowski space, 133
Minus partial order, 217
Mixed graph, 58
Mixed model, 85
Moment generating function, 64
Moore–Penrose inverse, 39, 74, 102, 120, 136, 189, 197
Multivariate kurtosis, 65
Multivariate skewness, 65

N
Non-singular cycle, 59
Non-singular graph, 59
Nonbinary analog of Boolean algebra, 15
Normed linear space, 144
Number of spanning trees, 34

O
Oblique projector, 102
Orientation of a bipartite graph, 5
Oriented graph, 1
Orthogonal projector, 74, 197
Outer inverse, 197

P
Parallel edges, 46
Partial order, 197
Partitioned matrix, 74, 101
Perturbed operator, 121
Philatelic magic square, 230
Poset, 198
Preorder, 198
Principal ideal domain, 172
Projective free ring, 172
Projective module, 172
Projector, 197
Projector; oblique, 102

Q
q-Analogue, 13, 33
q-Binomial coefficient, 15
Quadratic sufficiency, 87
Quasi-normal, 87
Index

R
- Regular graph, 34
Rank, 196
Rank function, 14
Rank-one perturbation, 121
Rankset, 14
Regressors, 112
Regular element, 183
Regular graph, 34
Regular incline, 185
Regular ring, 183
Resistance matrix, 39
Reverse order law, 134
Rhomboid, 237
Right perfect ring, 177
Row space, 196

S
Sage, 40
Second immanant, 34
Semi-magic matrix, 228
Semiring of nonnegative matrices, 177
Semisymmetric Jordan basis, 15
Semisymmetric Jordan chain, 15
Shorted matrix, 217
Singular cycle, 59
Singular graph, 59
Singular values, 14
Skew energy, 8
Skew normal copula, 64, 69
Skew normal distribution, 64
Skew spectrum, 2
Skew t-copula, 64
Skew t-distribution, 64
Skew $t_{p,v}$-copula, 70
Skewness vector, 65
Sklar’s theorem, 69
Space decomposition, 197
Space equivalent matrices, 201
Space preorder, 201
Spanning tree, 34
Spectrum, 2
Star partial order, 129
Star-product of matrices, 65
Structured inverse Eigenvalue problem, 6
Sub-model, 86
Supremum, 199
Symmetric, 196
Symmetric group, 13
Symmetric Jordan chain, 15

T
Third immanant, 34
Total order, 198
Transpose, 196
Transpose; conjugate, 196

U
UBLUE, 85
UMVUE, 88
Undirected graph, 1
Unicyclic graph, 59
Uniformly best linear unbiased estimator, 85
Uniformly minimum variance unbiased estimator, 88
Up operator, 14
Upper bound, 199
Upper semilattice, 199

V
Variance covariance matrix, 73
Variance-covariance matrix, 85
Vertex edge incidence matrix, 58

W
Weighted directed graph, 57–59