

Author Index

- Abramovitz, M., 289
- Bathe, K.J., 390
 Barbosa, J., 517
 Bayo, E.P., 509
 Beck, J.L., 435
 Berrah, M.K., 493
 Biot, M.A., 580
 Brock, J.E., 154
- Caughey, T.K., 181, 185
 Chao, C.C., 364
 Crandall, S.H., 126, 149, 380, 481
- Dasgupta, G., 582
 Den Hartog, J.P., 243
 Der Kiureghian, A., 509
 Dowding, C.H., 561
 Drnevich, V.P., 557
 Dugundji, J., 269
 Dunkerley, S., 149
- Elsabee, F., 523
- Flannery, B.P., 189
- Griffith, B.A., 33
- Hall, J.F., 435
 Hardin, B.O., 557
 Henrici, P., 413
 Hildebrand, F.B., 413
 Hunt, H., 39
 Hsieh, A.H., 249
- Iguchi, M., 542
- Kausel, E., 191, 279, 349, 360, 365, 435, 490, 493, 513,
 517, 520, 523, 544, 561, 584
 Kramers, H.A., 571
- Kreyszig, E., 78
 Kronig, R. de L., 571
- Laird, J.P., 557
 Lancaster, P., 640
- Mark, W.D., 481
 Masing, G., 543
 Morray, J.P., 523
- O'Kelly, M.E.J., 181
- Pais, A.L., 490, 520, 544, 584
 Papoulis, A., 566
 Parseval des Chênes, M.A., 433
 Press, W.H., 189
- Roësset, J.M., 435, 517, 602
- Sackman, J.L., 582
 Scaletti, H., 602
 Stegun, I.A., 289
 Stokoe, K.H., 557
 Strutt, J.W. (Lord Rayleigh), 166
 Synge, J.L., 33
- Teukolsky, S.A., 189
 Timoshenko, S., 256
- Vetterling, W.T., 189
- Wang, C.M., 277
 Wang, C.Y., 277
 Whitman, R.V., 523
 Williams, F.W., 170
 Wilson, E.L., 509
 Wittrick, W.H., 170
 Woinowsky-Krieger, S., 256
- Zendagui, D., 493

Subject Index

- Added mass of fluid, 18–20
- Aliasing, 428
- Analytical mechanics, 39–54
- Antiphase motion, 231
- Assumed modes method, 251, 388, 390, 391–399
- Attenuation, 313, 334, 500, 535, 562, 581

- Bars, 47, 252
- Beam
 - Beam on elastic foundation, 338
 - Bending beam, 5–9, 139–141, 252–254, 267–277, 318–332, 337–341, 337–341
 - Euler-Bernoulli beam, 253, 267–277, 318–332, 337
 - Nonuniform beam, 277–279
 - Rayleigh beam, 254
 - Shear beam
 - Timoshenko beam, 254–257
- Beating phenomenon, 344
- Biggs-Roësset equation, 194
- Blast vibrations, 561
- Block-circulant matrices, 593, 644
- Body waves, 334, 340, 349, 562
- Box function, 81, 418, 419, 421–424, 619–620, 626

- Car on bumpy road, 89–92
- Cardanian rotation, 32
- Caughey damping, 180, 185–189
- Causal functions, 83, 113, 124, 125, 126, 435, 565, 567, 569–573
- Central Differences, 407
- Circulant matrices, 642–646
- Circular plate on elastic foundation, 10
- Cleaning of eigenvectors, 376
- Coherence function, 484, 486, 491–494
- Complex modes, 209–222
- Complex stiffness, 93, 115–118, 173, 174, 175, 223, 234, 345, 349
- Conditional stability, 413–416
- Cones, 295–302
- Continuous systems, 251
- Convolution, 83–85, 108, 111
- Correspondence principle, 580–585

- D'Alembert principle, 21, 37, 45
- Damped MDOF systems, 176–180
- Damping
 - frictional damping, 63–66
 - hysteretic damping, 116–119, 127–130, 194–196, 234, 552, 555, 556, 560, 563, 581, 584, 585
 - proportional, 176, 181
 - Viscous damping, 29–31, 119–123
- Damping matrix for prescribed modal damping, 189–190
- Decibel scale, 236
- Degrees of freedom, 20–25
- Design spectrum, 505–507
- Dirac-Delta function, 82, 83, 428, 619
- Discretization of continuous systems, 25–29
- Dispersion, 334, 336, 342, 345, 349, 366, 487, 570
- Doublet function, 620
- Duhamel integral, 83
- Dunkerley's method, 149–157
- Dynamic stiffness see complex stiffness

- Earthquake Magnitude, 495
- Earthquake motions, 494
- Eccentric mass vibrator, 100–102, 248
- Energy dissipation, 118–130
- Ergodic processes, 483
- Estimation of frequencies, 146–175
- Eulerian rotation, 33
- Expansion theorem, 134, 178, 202, 374
- Exponential window method, 115, 236, 370, 434–440

- Finite elements, 440–480
- Floating body, 4, 18–20
- Folding, 422, 428
- Fourier methods, 417–440
 - Aliasing, 428–430
 - Discrete Fourier series, 423
 - Discrete Fourier transform, 422
 - Fast Fourier transform, 426
 - Folding, 428
 - Fourier series, 420
 - Fourier transform, 417

Subject Index

715

- Fundamental sampling theorem, 430–431
- Parseval's theorem, 433
- Wraparound, 428
- Frame (portal), 10
- Free vibration, 56–66, 74, 131–137
- Frictional damping see Damping
- Frustrums see Cones

- Galerkin, 381, 384–387
- Gaussian bell, 627
- Gaussian quadrature, 441–451
- General solution, 55, 79, 83–85
- Generalized coordinates, 40
- Gram-Schmidt rinsing, 374
- Group velocity, 334, 342–345
- Gutenberg-Richter, 499
- Gyroscopic forces, 585

- Half power bandwidth, 103–106
- Hanning bell, 626
- Harmonic response, 92–118, 223–250
 - eccentric mass vibrator, 100–102
- Harmonic forcing function, 92–96, 223–224
- Harmonic support excitation, 96–100, 224–225
- Heaviside function See unit step function
- Heuristic method, 25, 26, 77
- Hilbert transform, 565
- Horn see Cones
- Hyperbolic model, 556
- Hysteretic damping see Damping

- Iguchi's approximation, 541
- Impedance see complex stiffness
- Impulse, 36–37, 81–82, 87, 111–113
- Inelastic soil behavior, 551–561
- Inertial interaction, 515, 520
- Inertial reference frame, 31
- Interlacing properties of eigenvalues, 162–167
- Inverse iteration, 371–378
- Ivan inelastic model, 555

- Kinematic interaction, 514, 519, 540–551
- Kinematics, 31
- Kinetic energy, 36
- Kramer's Kronig conditions, 570

- Lagrange equations, 42–54, 381–399
- Lanchester mass damper, 243
- Laplace transform, 434
- Linear spring, 3
- Logarithmic decrement, 74

- Masing rule, 553
- Mass properties, 12–20
- Mindlin plate, 341
- Minimax property of Rayleigh's quotient, 162–166
- Minimum phase systems, 572
- Modal analysis, 176–180
- Modal partition of energy, 137
- Modeling, 22–25
- Modified Mercalli intensity, 498–499
- Momentum, linear and rotational, 36–39
- Moving load, 274–277

- Newmark's beta method, 404
- Newton's laws, 35
- Non-classical modes see Complex modes
- Non-proportional damping matrices, 191–194
- Normalized eigenvectors, 134, 580
- Number of modes in modal summation, 203–205
- Numerical integration, 400–416, 441–451
- Nyquist frequency, 114, 422, 423, 426, 430, 431, 433, 437, 439

- Ocean waves, 336–337
- Orthogonality conditions, 132, 215, 259, 265, 274, 302

- Parseval's theorem, 433
- Particular solution, 55, 76–79
- Pendulum, 49, 53
- Perturbation of mass & stiffness, 157–162
- Phase
 - angle, 58
 - Antiphase motion, 231
 - In-phase motion, 231
 - Opposite phase motion, 231
 - unwrapping, 487
- Phase portrait, 67–73
- Phase velocity, 335
- Pi-delta effect, 141
- Plate bending, 256, 302–305
- Poisson's ratio, 2
- Poles, 60–61, 210–213, 573–577, 623
- Positive definiteness, 633–642
- Problem sets, 647

- Quadratic eigenvalue problem, 210

- Ramberg-Osgood, 558
- Random processes, 481
- Rayleigh beam, 254
- Rayleigh damping, 184–185
- Rayleigh quotient, 147–149
- Rayleigh-Ritz, 384–390
- Reciprocity principle, 236–238
- Response spectrum, 88–89, 502–513
- Richter scale, 495
- Ricker wavelet, 628
- Rigid body condition for linear member, 11
- Rigid body mass properties, 12–17
- Rigid body, mechanical principles, 31–39
- Rods, 173–175, 252, 260–266, 306–318, 334, 345–348, 603
- Rotational spring, 4
- Rotationally periodic structures, 590–595
- Runge-Kutta, 410–412

- Seismic Intensity, 497–499
 Seismic moment, 495, 497
 Seismic risk, 499–500
 SH waves, 349–358
 Shear beam, 4, 146, 279–292
 Discrete shear beam, 610–618
 Non-uniform shear beam, 287–292
 Shear beam buckling, 146
 Shear deformation, 8
 Shift by Rayleigh quotient, 374
 Ship in rough seas, 89–92
 Sign count, 170–175
 Sign count of stiffness matrix, 168–175
 Singularity functions, 619
 Soil amplification, 355–358, 534–539
 Soil-structure interaction, 513–551
 Control Motion, 358, 520, 536–539
 Iguchi's approximation, 541
 Inertial interaction, 515, 520
 Kinematic interaction, 514, 519, 540–551
 Substructure theorem, 522
 Superposition approach, 518
 Three-step approach, 519
 Solids, 257
 Spatial coherence of seismic motions, 488–494
 Spatially periodic structures, 596–610
 Spatially varying ground motions, 207–209
 Spectral Analysis of Surface Waves (SASW), 486
 Spectral density functions, 483
 Spectral elements, 305, 348–370
 Spectral estimation, 484
 Stability see Pi-Delta effects
 Standing wave, 342
 Static correction, 205–207
 Stationary processes, 482
 Steady-state response, 223, 224
 Step load, 80, 81
 Stiffness matrix method for layered media, 349–370
 Stiffness of linear systems, 3–11
 Stiffness of rigid, circular foundations, 10, 520–521
 Stiffness properties, 3–11
 Stochastic processes, 481
 Strain, 2
 Stress, 2
 Sturm sequence property, 167–168
 Support motion
 Car on bumpy road, 89–92
 MDOF systems, 196–202
 SDOF systems, 85–87
 Ship on rough seas, 89–92
 Taut string, 251
 Timoshenko beam, 254
 Torsional vibration absorber, 249–250
 Transfer function see Harmonic response
 Transient response, 235
 Trial functions, 379, 387, 390, 391
 Tripartite spectrum, 88–89, 504
 Tuned mass damper, 239–244
 Unconditional stability, 413–416
 Unit step function, 620
 Vibration absorber, 239
 Vibration isolation, 246–249
 Virtual displacements (virtual work), 42–45, 380, 384–388, 451, 453
 Viscous damping see Damping
 Vortex shedding, 238
 Wave equation, 261, 334–335
 Wavelets, 626
 Waves, 333
 Love waves, 349, 353, 354
 Rayleigh waves, 358, 362
 SH waves, 349–358
 Stoneley waves, 349
 SVP waves, 358–362
 Weighted modal damping, 194–196
 Weighted residuals, 378–384
 Wrap-around, 428
 Zeros of transfer function, 233–234, 573–577