

Index

A

Acceleration response spectra (ARS), 181
Accelerograph, 37
Aleatory randomness, 174, 197, 411
Amplification factor, 343
Amplification function, 210
Arias intensity, 39, 233
Autocorrelation function, 60

B

Balance of plant (BOP), 5
Baseline correction, 265
Boiling water reactor (BWR), 1
Boolean algebra, 526

C

CANDU, 2
Central limit theorem, 64, 89, 562
Complete quadratic combination (CQC), 94
Composite variability, 413
Conditional mean spectrum, 180
Conservative deterministic failure margin (CDFM), 417, 441
Consistent-mass, 290
Consistent time-histories, 264
Continental drift, 18
Controlling earthquake, 171
Conventional island (CI), 5
Core damage frequency (CDF), 16, 517
Correlation coefficient of spectral accelerations, 50

D

Damping, 291
Damping ratio, 231, 371
Design basis earthquake (DBE), 8, 538
Design response spectrum (DRS), 122, 133
Deterministic seismic hazard analysis (DSHA), 153
Digital filter, 584
Direct spectra-to-spectra method, 137, 332, 339
Direct time integration method, 98
Discrete-time Fourier transform, 577

Discrete Fourier transform, 578
Drift, 264
Duhamel integral, 80
Dynamic magnification factor (DMF), 82
Dynamic stiffness matrix, 386

E

Earthquake excitation factor, 85, 97
Eigenfunction, 268
Eigenvalue problem, 267
El Centro Earthquake, 117
Elastic rebound theory, 22
Empirical mode decomposition (EMD), 248
Energy spectral density (ESD), 63
Epistemic uncertainty, 174, 197, 411
Equipment response factor, 437
Equivalent damping coefficient, 347
Ergodic process, 63
Event tree, 534

F

Factor of safety, 418
Failure event, 522
Fault, 22
Fault tree, 524
Finite element model, 283, 300
First-passage problem, 75
Flexural stiffness, 318
Floor response spectra (FRS), 15, 328, 331
Forced vibration, 82
Foundation input response spectra (FIRS), 210, 384
Foundation level input response spectra (FLIRS), 394
Fourier amplitude spectra (FAS), 62, 181
Fourier displacement spectrum, 188
Fourier series, 572
Fourier transform, 87, 573
Fragility analysis (FA), 417
Fragility curve, 15
Free vibration, 78
Frequency-domain dynamic response analysis, 191

FRS-CQC, 348
Fukushima, 34

G

Gaussian excitation, 86
Gaussian process, 64, 89
Gaussian white noise, 589
Great East Japan Earthquake, 32
Ground-motion prediction equation (GMPE),
44, 153, 179
Ground acceleration capacity, 410, 413
Ground motion, 184, 230
Ground motion model, 184
Ground motion parameter (GMP), 410
Ground response spectra (GRS), 13, 116, 131
Gutenberg-Richter recurrence relationship, 160

H

Harmonic load, 82
Hazard-consistent strain-compatible material
properties (HCSCP), 212
HCLPF, 15
HCLPF capacity, 416
Heat exchanger, 446
Hilbert amplitude spectrum (HAS), 251
Hilbert energy spectrum (HES), 251
Hilbert spectral analysis (HSA), 248
Hilbert-Huang transform (HHT), 247

I

Inelastic energy absorption factor, 420, 436
Influence matrix method, 271
Instantaneous frequency, 251
Interplate earthquake, 22
Intraplate earthquake, 24
Intrinsic mode function (IMF), 248

L

Large early release frequency (LERF), 16, 517
Logic tree, 175
Lognormal distribution, 564
Love wave, 28
Lumped-mass, 290

M

Main control room (MCR), 11
Masonry block wall, 483
Mean-square response, 88, 92--93, 105
Mesh, 287, 298
Method of residue, 108

Minimal cut set, 522
Missing-mass effect, 314
Modal combination, 351
Modal combination for FRS, 348
Modal participation factor, 97
Modified Mercalli intensity (MMI), 28
Moment magnitude, 29
Multiple degrees-of-freedom (MDOF), 84

N

Nonexceedance probability (NEP), 122
Nonstationary, 237
Nonstationary process, 62
Normal distribution, 562
Nuclear island (NI), 5
Nuclear power plant (NPP), 1
Nuclear steam plant (NSP), 5

P

P-wave, 24
Peak broadening, 339
Peak factor, 72, 76, 94
Peak ground acceleration (PGA), 39
Peak ground displacement (PGD), 39
Peak ground velocity (PGV), 39
Peak shifting, 339
Plate boundaries, 20
Plate tectonics, 18
Poisson distribution, 160
Poisson process, 75, 163
Power spectral density (PSD), 42, 87, 92, 232
Predicted spectrum, 179
Pressurized water reactor (PWR), 1
Probabilistic seismic hazard analysis (PSHA), 15,
54, 154
Probability density function (PDF), 58
Probability distribution function, 57
Probability mass function (PMF), 168, 176
Pseudo-acceleration response spectrum, 116, 120
Pseudo-velocity response spectrum, 116, 120

R

Random process, 57
Random variable, 57
Random vibration theory (RVT), 181, 189
Rayleigh wave, 28
Reactor building (RB), 5, 7
Reference earthquake, 418
Reference hard rock, 184, 189, 214
Reliability block diagram, 520
Resampling, 586

Response spectrum, **115**
Review level earthquake (RLE), **16, 418, 544**
Richter local magnitude, **29**

S

S-wave, **24**
Safe shutdown earthquake (SSE), **418, 538**
Safety functions, **8**
Safety objectives, **11**
Sampling, **568**
Scaling method, **365**
Screening table, **543, 546**
Second-moment method, **440**
Secondary control area (SCA), **10**
Seismic design spectrum, **176**
Seismic energy, **30**
Seismic fragility, **15, 410**
Seismic fragility analysis, **518**
Seismic hazard, **13, 230, 410**
Seismic hazard analysis, **518**
Seismic hazard curve, **163, 184, 410, 536**
Seismic hazard deaggregation (SHD), **167**
Seismic levels, **8**
Seismic margin assessment (SMA), **16, 328, 418, 538**
Seismic probabilistic risk assessment (SPRA), **16, 517**
Seismic probabilistic safety assessment (seismic PSA), **16, 328, 517**
Seismic response history analysis (SRHA), **97, 230**
Seismic response spectrum analysis (SRSA), **99**
Seismic risk, **13, 16**
Seismic risk quantification, **518**
Seismicity, **8**
Seismograph, **37**
Shear-wave velocity, **183, 198**
Shear area, **317**
Shear modulus, **183**
Single degree-of-freedom (SDOF), **77**
Site condition, **230**
Site design earthquake (SDE), **8**
Site response analysis, **181**
Soil condition, **181**

Soil–structure interaction (SSI), **15, 383, 431**
Spectral shape, **419**
Spectrum-compatible ground motion, **230, 232, 235, 256, 271**
Spectrum amplification factor, **125**
Spectrum shape, **422**
Square root of sum of squares (SRSS), **94**
SSC, **8, 15, 328**
Standard deviation, **60**
Standard deviation of prediction equation, **44**
Stationary Gaussian process, **88**
Stationary process, **59, 89**
Stationary response, **86**
Statistical independence of ground motions, **233**
Stick model, **317**
Strength factor, **420**
Strong-motion duration, **233**
Strong ground motion, **37**
Structure response factor, **421, 438**
Substructure method, **386**
Surrogate element, **546**
System analysis, **518**
System identification, **368**

T

t-response spectrum (tRS), **137, 346**
Time-domain dynamic response analysis, **193**
Time-history, **13**
Time-history analysis, **15, 332**
Transient response, **79**
Tripartite, **120**
Tsunami, **31**

U

Uniform hazard spectrum (UHS), **154, 169, 177, 214**

V

Vector-valued PSHA, **166**
Vector-valued SHD, **172**

W

Wavelet, **242**