

Index

- ABCD parameters, 511, 515
- a.c. bridge, 132–6
- active element, 3
- active power, 187
- admittance, 123–6
 - complex, 116, 123
 - driving point, 504
 - generalized, 348, 361–3
 - transfer, 504
- admittance matrix, 513
- admittance parameters, 508
- alternating quantity, 2, 99
- ammeter, 251
- ampere, 6
- amplifier, 78, 510
- amplitude of a.c. waveform, 99
- amplitude
 - response, 367
 - spectrum, 474
- angular frequency, 99
- Argand digram, 106
- argument of complex number, 105
- asymmetrical network, 87
- attenuator, 45, 534
- autotransformer, 214–17
- auxiliary equation, 288
- average power, 187

- balanced network, 87, 502
- band-pass characteristic, 157, 177
- bandwidth, 155
- battery model, 43
- bias point, 426
- bilateral element, 418
- Bode diagram, 130
- branch, 43

- break frequency, 131
- break point, 429
- bridge circuits, 61, 72, 132–40, 221
- Butterworth filter, 372

- capacitance, 2, 13, 103
 - stored energy in, 24
- capacitances
 - in parallel, 26
 - in series, 24
- capacitive circuit
 - reactance, 103
 - susceptance, 125
- capacitors
 - loss-angle in, 150
 - losses in, 149
 - model for, 36
- Cartesian coordinates, 106
- cascaded networks, 518, 530
- chain matrix, 518–25
- characteristic impedance, 532
- characteristics (of device), 419–25
- charge, 5
- circle diagram, 129
- circuit
 - active, 3
 - distributed, 3
 - dual, 37, 164
 - lumped model, 3
 - passive, 3, 44
- circuit reduction, 84
- coefficient of coupling, 33, 175
- coil, 26
- compensation theorem, 82
- complementary function, 285

- complex
 - algebra, 106
 - conjugate, 198
 - exponential, 107
 - frequency, 348, 369
 - impedance, 110
 - plane, 106, 108, 361
 - power, 198
 - quantity, 105
- conductance, 19, 69, 124
- conduction angle, 20, 452
- conductivity, 20
- conjugate bridge, 133
- conservation
 - of charge, 13
 - of energy, 9, 13
 - of watts and vars, 194
- controlled source, 33, 75, 507
- convolution, 392–405
 - integral, 396
 - theorem, 401
- copper loss, 21, 213
- corner frequency, 131
- corresponding ends (of coil), 32, 142
- coulomb, 6
- coupled coils, 141, 301
- coupling coefficient, 33, 175
- coupling network, 127
- Cramer's rule, 54
- critical damping, 294
- critical coupling, 174–6
- current
 - alternating, 2, 98–101
 - direct, 2
- current convention, 7
- current divider, 45, 165
- current source, 11, 117
- D-impedance, 309
- D-operator, 304
- damped natural frequency, 294
- damped sinusoid, 293
- damping, 294, 362–4
- damping constant, 294
- decibel, 130
- delay time, 312
- delayed function, 326
- delta circuit, 66
- delta function, 319
- dependent source, 75
- determinant, 54
- differential operator, 309
- differentiating circuit, 316
- diode
 - ideal, 429
 - real, 437
 - zener, 437
- Dirac function, 319
- discontinuous function, 317
- discriminant, 293
- divider, 45, 350
- dot convention, 32, 142
- double-energy circuit, 291
- doublet (unit), 325
- driving point impedance, 143, 505
- duality, 37
- dual networks, 45, 67, 164
- dynamic resistance, 426
 - of resonant circuit, 166
- dynamometer, 251
- effective resistance, 146
- effective value of sinusoid, 100
- electrical angle, 100
- electrodynamometer, 251
- electrokinetic momentum, 347
- electromotive force (e.m.f.), 1, 27
- element
 - active, 3
 - bilateral, 418
 - ideal, 36
 - lumped, 3
 - non-linear, 418
 - passive, 3, 36
- energy
 - initial, 281, 291
 - sink, 1, 9
 - source, 1, 9
 - storage in elements, 2, 24, 28
- equivalent circuits
 - for capacitor, 149
 - for inductor, 147
 - series–parallel, 21
 - star–delta, 66
- Euler's identity, 105
- even function, 466
- excitation function, 349
- exciting current, 202, 205
- exponential Fourier series, 471
- farad, 23
- Faraday's law, 31
- field, 1
- filters
 - for rectifiers, 482–6
 - high-pass, 127

- low-pass, 372
- notch, 140
- twin-T, 136, 528
- final value theorem, 358
- first-order circuit, 291
- flux
 - density (B), 203
 - leakage, 202
 - magnetic, 26, 202
 - mutual, 31
- forced response, 285
- form factor, 101
- Foster's reactance theorem, 173
- Fourier series
 - coefficients, 460
 - cosine, 466
 - exponential, 471
 - for rectifier, 469
 - sine, 466
- frequency
 - angular, 99
 - complex, 348
 - half-power, 155
 - natural, 294
 - negative, 472
 - response, 126
 - spectrum, 466
 - undamped, 294
- frequency changer, 445
- function
 - network, 349
 - rational, 334
 - transfer, 126
- generalized network function, 349
- generator (three-phase), 231
- Gibbs phenomena, 465
- g -parameters, 507
- gyrator, 524
- half-power bandwidth, 155
- harmonic components, 461
- henry, 27
- hertz, 99
- hybrid parameters, 506
- hysteresis loss, 203
- ideal source, 11
- ideal transformer, 199, 522
- image impedance, 531
- immittance, 348
- impedance
 - complex, 110
 - D-operator, 309
 - driving point, 143, 504
 - dynamic, 166
 - generalized, 348
 - input, 143
 - modulus of, 110
 - transfer, 505
- impedance diagram, 115
- impedance matrix, 513
- impedance transformation, 200
- impulse
 - function, 317, 319
 - response, 320, 351
 - train, 392
- incremental (slope) resistance, 426
- independent parameters, 502
- induced e.m.f. 27
- inductance, 2, 26, 102
 - leakage, 207
 - mutual, 31, 35, 141
 - self, 26, 27
 - stored energy in, 28
- inductances
 - in parallel, 29
 - in series, 30
- inductive reactance, 103
- inductor
 - losses in, 146
 - model for, 36
- initial conditions, 281, 289
- initial value theorem, 358
- in-phase component, 192
- insertion loss, 536
- integrating circuit, 316
- inverse matrix, 515
- inverse transform, 328
- iron loss, 203
- iterative impedance, 530
- joule, 8
- j -operator, 106
- Kirchhoff's laws, 13–18, 419
 - current, 13
 - voltage, 16
- ladder method, 87, 372
- ladder network, 87
- Laplace transform, 328
 - of delayed functions, 358
 - of derivative, 330
 - of integral, 331
- lattice network, 72, 521

- leakage inductance, 207
- linear element, 3, 418
- linearity, 57
- line spectra, 475
- load line, 423
- locus diagram, 129
- logarithmic decrement, 295
- loop, 44
- loop equations, 48, 52
- loss-angle (of capacitor), 150
- low-pass filter, 372
- lumped element, 3
- magnetizing current, 203
- magnetizing force (H), 203
- magnitude (of a.c. waveform), 100
- mark-space ratio, 376
- matching, 201, 218–21
- maximum power transfer, 217
- Maxwell's cyclic currents, 49
- mesh, 44
- mesh analysis, 47–50, 52, 71, 545
- Millman's theorem, 86
- mistuning, 160
- modulator, 445
- multiple resonance, 169–73
- mutual conductance, 69, 70
- mutual inductance, 31, 35, 141, 175, 344
- mutual resistance, 48, 53
- natural response, 285
- negative impedance converter, 524
- network, 44
- network function, 349
- nodal analysis, 67–70, 71, 125
- nodal equations, 69
- node, 13, 43
- non-linear elements, 3, 418
- Norton's theorem 64
- Nyquist diagram, 129
- Odd function, 466
- ohm, 19
- Ohm's law, 18, 112
- open-circuit impedance, 505
- open-circuit test, 209
- operating point, 425
- operational amplifier, 78, 510
- oscillatory response, 293, 363
- output resistance, 43, 80
- overdamped circuit, 294, 362
- parabola (unit), 325
- parallel resonant circuit, 164
- Parseval's theorem, 478
- partial fractions, 334–9
- particular integral, 285
- passive circuit, 3
- peak inverse voltage, 450
- period, 99
- periodicity theorem, 382
- phase angle, 99
- phase response, 239, 367
- phase sequence, 246
- phase sensitive detector, 447
- phase transformation, 270
- phasor
 - cartesian form, 105
 - diagram, 113, 118
 - polar form, 106
 - rotting, 107
 - stationary, 108
- pi-network, 516
- piecewise-linear circuits, 428–43
- poles
 - of admittance, 362
 - of impedance, 172
 - of network function, 360
 - repeated, 362
- pole-zero methods, 359–72
- pole-zero diagram, 361
- port, 44
- potential difference (p.d.), 7
- potentiometer, 46
- power
 - active and reactive, 187, 190
 - apparent, 191
 - average, 187–8
 - complex, 198
 - diagram, 249
 - in harmonic components, 478
 - instantaneous, 8, 188, 273
 - real, 187, 188
 - sign convention, 9, 188
 - triangle, 191
- power factor, 150, 194
- power factor correction, 194, 249
- practical voltage source, 42
- pulse
 - repeated, 376
 - transform of, 381
- quadrature component, 192
- quasi-steady state, 377

- Q -factor,
 - of capacitor, 150
 - of inductor, 147
 - of resonant circuit, 165, 169, 253, 294
- radian, 99
- ramp function, 325
- rational function, 334
- rationalization, 124
- reactance, 103, 110
- reactive power, 190
- reciprocal network, 505
- reciprocity theorem, 58, 546
- rectifier circuits, 448
 - bridge, 453
 - full-wave, 453
 - half-wave, 448
 - ripple in, 482
- regulation (of transformer), 211
- resistance, 2, 18, 101
- resistances
 - in parallel, 22
 - in series, 21
- resistivity, 20
- resistor
 - model for, 36
 - non-linear, 445
- resonance, 146, 158
- resonance curve, 162
- resonant circuits
 - inductively coupled, 173
 - losses in, 151
 - magnification factor in, 157, 165
 - parallel, 164
 - series, 151
- resonant frequency, 153, 158
- response function, 349
- root mean square (r.m.s.) value, 101, 189, 478
- roots (of polynomial), 354
- Rosen's theorem, 67
- s (complex frequency), 348
 - domain, 340
 - plane, 361
- sampling, 394
- Schering bridge, 133
- Scott connection, 271
- second-order circuit, 291
- self inductance, 26
- shift theorem, 357
- short-circuit test, 210
- siemens, 19, 124
- sifting property, 394
- single-energy circuit, 291
- singularity function, 317–27
- sink, 9
- skin effect, 146
- small-signal model, 426
- source,
 - controlled, 33, 75, 507
 - current, 12, 64
 - dependent, 33, 75, 507
 - ideal, 11
 - practical, 42, 64
 - transformation, 64
 - voltage, 11, 64
- spectrum, 474
- stagger tuning, 177
- star connection, 66, 239
- star–delta transformation, 66, 86
- steady state, 280
- steady-state response, 285, 377
- step function, 318
- step response, 319
- substitution theorem, 81
- superposition theorem, 55, 546
- susceptance, 124
- symmetrical circuits, 87, 502
- tee network, 516
- Tee-pi transformation, 67, 138, 516
- Tellegen's theorem, 194
- Thévenin's theorem, 58, 313, 547
- Thévenin–Norton transformation, 64, 117
- third-harmonic current, 269
- three-phase circuit, 233
 - balanced load in, 236
 - delta connection in, 239
 - line voltage in, 235
 - neutral point in, 235
 - phase sequence in, 239, 246
 - phase voltage in, 235
 - star connection in, 239
 - unbalanced load in, 245
 - Y-connection in, 239
- thyristor, 455
- time constant, 286
- time domain, 340
- total response, 295
- transfer characteristic, 423
- transfer function, 126, 349

- transfer impedance, 505
- transformer
 - auto, 214
 - copper loss in, 213
 - core loss in, 203, 213
 - efficiency in, 213
 - equivalent circuit, 261
 - ideal, 199
 - regulation in, 211
 - single phase, 201
 - tests, 209, 261
 - third harmonic currents in, 269
 - three-phase, 258
- transformer bridge, 221
- transient response, 282, 285
- transistor, 423
 - model, 426, 427, 509
 - parameters, 503
- transmission parameters, 511
- triac, 459
- triangular pulse, 383
- tuning, 157
- turnover frequency, 131
- twin-T network, 136, 528
- two-phase voltages, 271
- two-port network, 126, 501
- two-wattmeter method, 253
- unbalanced network, 87
- underdamped circuit, 294, 362
- universal resonance curve, 161
- unsymmetrical network, 503
- var, 191
- volt, 7
- volt-ampere, 191
- voltage divider, 44, 350
- voltage source
 - ideal, 11
 - practical, 42, 64
- watt, 8
- wattmeter, 251
- waveform
 - rectified sine, 304, 469–71
 - sawtooth, 384
 - square, 381, 463–6
 - trapezoidal, 499
 - triangular, 383, 466–8
 - TV video, 390
- Wheatstone bridge, 61, 72
- Wien bridge, 135
- Y– Δ transformation, 66, 244
- y-parameters, 503
- zeros of network function, 172, 360
- z-parameters, 505