

Index

- Active power 257–60, 265, 362, 364
AC voltage generation 27, 224, 225, 232
Admittance operator 262, 263, 265
Ampère's law 161–3, 171, 172, 176, 180, 195, 228, 237, 238, 269, 324
Angular frequency 201, 251, 255, 258, 282, 287, 288
Apparent power 260
Attenuation constant 352–4, 378
- Balun transformer 69–71
- Capacitance 108, 109, 128, 131, 145, 159, 175, 239, 330
Capacitance matrix 118, 119, 122, 123, 134, 135, 160, 184, 243, 246
Capacitor 58, 108, 128, 129, 175, 239, 240, 241, 244, 245, 263, 278, 286
Capacitor charging process 278–82
Capacitor self-discharge 241
Chain matrix 355
see also Transfer matrix
Characteristic wave impedance 351, 352, 371, 373
Characteristic wave resistance 320, 340, 341, 343, 345, 352, 358
Charge continuity equation 238, 241, 336, 339
Complex amplitude 254, 315, 317, 318, 328, 356
see also Phasor
Complex power 260, 261, 320, 321, 325
Complex Poynting theorem 260–2, 320, 321
Complex Poynting vector 320–2, 324, 327–9
Conductance 144–6, 156, 159, 263
Conductance matrix 243
Conductivity 17, 18, 139, 140, 144, 159
Conductor 105, 139, 140, 149, 150, 155
Current density 90, 139–41, 146, 154, 164, 237, 322–4
Current intensity 92, 93, 142, 147, 162, 164, 240, 243
Current transducer 13–15
- DC voltage generation 223–4
Dielectric media 103, 104, 112, 321, 349
Dielectric polarization 103, 104, 318, 321, 351
Dielectric strength 58, 61, 103, 104, 106
Directional coupler 19–21
Displacement current density 237–42, 285, 310, 322, 332
Distributed parameters 158, 336
Dynamic electric field 220
- Eddy currents 183, 219
Electric charge 89, 97, 99, 102, 103, 239
Electric charge density 90, 105, 133, 142, 242
Electric circuit 139, 141, 148, 150, 169–70
Electric displacement vector 89, 102, 103
Electric energy 108, 110, 121, 128, 178, 247, 252, 259, 261, 289
Electric energy density 111, 112, 128, 129, 311
Electric field vector 89, 101, 104, 106, 130, 139, 142, 207, 208, 316
Electric force 89, 125–8, 136, 137, 149, 187
Electric induction phenomena 205, 206, 237, 249
Electric susceptibility 104
Electric torque 125, 129, 187
Electrolytic tank 159
Electromagnet 188
Electromagnetic field 87, 220, 307, 309–14, 328, 349
Electromagnetic wave 205, 307, 309–12
Electromechanical energy conversion 221–3
Electromotive force 101, 151, 210

- Electrostatic field
 - of coaxial cable 131, 132
 - of filament of charge 107, 108, 130
 - of two-conductor transmission line 8–10, 112–17
- Even mode 69, 70, 372–4
- Exponential line 31, 33–4

- Ferromagnetic media 168–9, 182, 219
- Field polarization 315–17
- Free regime 276–8, 283, 284, 288
- Frequency 251, 252, 254, 322

- Generator 149–51, 155
 - applied field 149, 151
 - electromotive force 151, 155
- Gradient electric field 99, 100, 163, 207, 213
- Ground electrode 154
- Grounding 23, 24, 43, 44, 154

- Hertz dipole 328
- Hysteresis losses 182–3

- Ideal transformer 269
- Impedance operator 262, 263, 268, 321
- Inductance 174, 175, 181, 184, 198, 216, 267, 269, 280
 - matrix 184, 185, 187, 192, 196, 217
- Induction
 - electric field 177, 207, 208, 213
 - heating 229
 - law 210–13, 217, 220, 222–4, 268, 278, 336, 338
 - machine 25–9
- Inductor 174, 177, 178, 229–31
- Instantaneous power 257–9, 313, 314

- Joule effect 149, 219, 222, 229, 259
- Joule losses 149, 150, 252, 261, 289, 290
 - density 149, 311

- Kirchhoff's current law 142, 143, 148, 165
- Kirchhoff's voltage law 99, 102, 148, 164

- Laplace–Lorentz force 90, 220, 235
- Lenz's law 229, 270, 271, 276
- Line input impedance 356, 358–61
- Line-matching techniques 31, 33, 73, 365–8
- Load reflection coefficient 347, 356, 357
- Loss angle 350–2
- Loudspeaker 77–9, 234
- Lumped parameters 206, 249, 250, 335

- Magnetic circuit 169, 170, 173, 195, 197, 199, 232
- Magnetic co-energy 202
- Magnetic coupling factor 185, 192, 198, 269, 273
- Magnetic energy 174, 177, 178, 182, 186, 192, 252, 259, 261, 289
 - density 178, 179, 311, 312
- Magnetic field
 - of coaxial cable 179–82
 - of two-wire transmission line 190–1
 - vector 89, 161, 162, 166, 238, 242, 269
- Magnetic flux linkage 174–6, 184, 191, 268, 279, 336, 338
- Magnetic force 40, 89, 187–8, 194, 201, 221
- Magnetic hysteresis 168, 169, 182
- Magnetic induction
 - flux 164, 165, 176, 196, 199, 224
 - phenomena 205, 206, 207, 210, 233, 237, 249
 - vector 89, 164, 165, 227
- Magnetic materials 168–9
- Magnetic reluctance 173, 174, 177, 186, 195, 199
- Magnetic saturation 13, 168, 169, 212, 215
- Magnetic susceptibility 168
- Magnetic torque 27, 187, 201, 202
- Magnetic voltage 161, 163, 164
- Magnetomotive force 161–2
- Matched line 342, 343, 352, 358, 362, 364, 375
- Material media constitutive relations 90, 91, 99, 104, 140, 161, 168, 172, 207, 237, 317–8
- Maxwell's equations 87, 90, 97, 177, 205, 208, 307, 310, 317, 322
- Maxwell's equations (phasor domain) 317, 318, 320, 322, 330
- Microphone 233–4
- Microwave splitter 65–8
- Mismatched line 343, 362, 364, 365
- Moving circuit systems 27, 37, 38, 41, 220, 221, 224, 225, 234
- Multiconductor transmission lines 335, 369–72
- Multiple circuit systems 183, 184, 186, 211, 217
- Multiple conductor systems 117–18, 123, 124, 134–6, 159, 184, 242–3

- Nonlinearity 14, 58, 104, 109, 110, 112, 126, 168, 172, 175, 178, 202, 212, 216
- Non-uniform transmission lines 31, 335, 354, 355, 383

- Odd mode 48, 50, 69, 70, 192, 372, 374
- Ohm's law 144, 152, 173, 250
- Overdamped transients 288

- Partial capacitance 122, 123, 159
- Permeability 91, 161, 168, 173, 318
- Permittivity 91, 99, 103, 109, 318, 372
- Per-unit-length
 - capacitance 137, 339, 341, 345, 372
 - conductance 156, 351
 - inductance 179, 190–2, 338, 339, 341, 345

- longitudinal impedance 350, 370, 378
resistance 156, 340
transverse admittance 350, 351, 370, 378
- Phase 251–3, 258, 259, 353
Phase constant 319, 352, 353
Phase velocity 351, 353, 373
Phasor 254, 255, 257, 260, 269, 277, 315–17, 349
see also Complex amplitude
- Potential coefficients matrix 121, 122
Potential vector 207, 208, 210
Potentiometer 146–8
Power factor 265, 267
Power factor compensation 4, 57, 264, 267
Power flow 259, 268, 311, 312
Power line carrier communication 47, 49, 54
Power line magnetic field 48, 165–7
Poynting theorem 259, 262, 311–13
Poynting vector 311, 312, 313, 314, 319, 321, 326, 328
Propagation constant 351, 352, 371, 380
Propagation mode 371, 373
Propagation velocity 340, 341, 345
Pulse propagation 342
Pulse reflection 342
- Quality factor 263–4
Quarter wave transformer 67, 365, 382
Quasi-stationary regime 205, 206, 249, 311, 313, 330, 335
- Reactance 263
Reactive power 260, 262, 264, 265
Resistance 144, 146, 147, 152, 154, 173, 217, 263
Resistor 144, 145, 149, 150, 250, 343
Resonance 62, 74, 263, 266, 291, 293, 330, 332
Root-mean-square field value 315–17
Root-mean-square value 252, 317
- Scalar potential 99, 106, 107, 154, 208
Sinusoidal quantities 251–2
- Skin effect 53, 55, 307, 322–6, 333, 334, 349, 350, 377
Standing wave pattern 362–4, 365, 368, 382, 385, 386
Standing wave ratio 362, 364
Stationary waves 360, 361
Steady-state harmonic regime 206, 250, 276
Stub matching 365, 366, 368
Susceptance 263
- Theory of relativity 87, 220
Three-phase systems 43, 47, 57, 61, 232–3, 294–7
Three-phase voltage generation 28, 232–3
Time-harmonic fields 315–17
Toroidal magnetic core 13, 195, 197
Transfer matrix 354, 355, 378, 384
see also Chain matrix
- Transformer 35, 73, 81, 169, 170, 227, 267, 268, 269, 274, 286
Transformer equivalent circuit 271–4, 299
Transformer impedance 270–71
Transient regimes 79, 83, 206, 276, 282, 286, 300
Transmission-line equations in the frequency domain 349, 351, 356
Transmission-line equations in the time domain 337, 339, 349
Transmission lines 7, 31, 66, 69, 307, 335, 337, 341, 345, 364, 369
Traveling waves 358–60
Tuning circuit 290–91
- Underdamped transients 288, 300, 301
Uniform plane wave 318, 327
- Voltage 92, 93, 99, 101, 163, 208–9, 211, 242
- Wave equation 309, 310, 318, 340
Wavelength 205, 249, 307, 318, 319, 353
Wheatstone bridge 148, 153