

Contents

Preface *IX*

Basis Notations *XIII*

Fundamental Constants and Frequently Used Numbers *XVII*

- 1 Equations of Steady Electric and Magnetic Fields in Media** *1*
- 1.1 Averaging Microscopic Maxwell Equations. Vectors of Electromagnetic Fields in Media *2*
- 1.2 Equations of Electrostatics and Magnetostatics in Medium *4*
- 1.3 Polarization of Media in a Constant Field *7*
Problems *12*
- 1.4 Answers and Solutions *17*

- 2 Electrostatics of Conductors and Dielectrics** *37*
- 2.1 Basic Concepts and Methods of Electrostatics *37*
Problems *41*
- 2.2 Special Methods of Electrostatics *45*
Problems *54*
- 2.3 Energy, Forces, and Thermodynamic Relations for Conductors and Dielectrics *59*
Problems *71*
- 2.4 Answers and Solutions *76*

- 3 Stationary Currents and Magnetic Fields in Media** *115*
- 3.1 Stationary Current *115*
Problems *123*
- 3.2 Magnetic Field in Magnetic Media *129*
Problems *131*
- 3.3 Energy, Forces, and Thermodynamic Relations for Magnetics *133*
Problems *145*
- 3.4 Electric and Magnetic Properties of Superconductors *149*
Problems *153*
Problems *155*

	Problems	160
3.5	Answers and Solutions	164
4	Quasi-Stationary Electromagnetic Field	193
4.1	Quasi-Stationary Phenomena in Linear Conductors	193
	Problems	197
4.2	Eddy Currents and Skin-Effect	201
	Problems	205
4.3	Magnetic Hydrodynamics	207
	Problems	222
4.4	Answers and Solutions	228
5	Maxwell Equations for Alternating and Inhomogeneous Fields	275
5.1	Different Forms of Maxwell Equations in Media. Coupling Equations and Electromagnetic Response Functions	275
	Problems	287
5.2	Causality Principle and Dispersion Relations	291
	Problems	296
5.3	Energy Relations for Alternating Electromagnetic Field in Media. Longitudinal Electric Oscillations	297
	Problems	302
5.4	Magnetic Oscillations and Magnetic Resonance	304
	Problems	306
5.5	Electrodynamics of Moving Media	308
	Problems	311
	Problems	321
5.6	Energy–Momentum Tensor in Dispersive Media	322
	Problems	327
5.7	Answers and Solutions	327
6	Propagation of Electromagnetic Waves	363
6.1	Transverse Waves in Isotropic Media. Reflection and Refraction of Waves	363
	Problems	377
6.2	Plane Waves in Anisotropic and Gyrotropic Media	382
	Problems	387
6.3	Scattering of Electromagnetic Waves by Macroscopic Bodies. Diffraction	390
	Problem	393
	Problems	401
6.4	Diffraction of X-Rays	405
	Problems	408
6.5	Answers and Solutions	410

7	Coherence and Nonlinear Waves	463
7.1	Coherence and Interference	463
	Problems	472
7.2	Random Waves and Waves in Randomly Inhomogeneous Media	477
	Problems	489
7.3	Waves in Nonlinear and Active Media	490
	Problems	503
7.4	Answers and Solutions	504
8	Electromagnetic Oscillations in Finite Bodies	521
8.1	Electromagnetic Waves in Waveguides	521
	Problems	524
8.2	Electromagnetic Oscillations in Resonators	530
	Problems	531
8.3	Answers and Solutions	536
9	Interaction of Charged Particles with Equilibrium and Nonequilibrium Media	565
9.1	Ionization and Radiation Energy Losses of Fast Particles in Media	565
	Problems	590
9.2	Macroscopic Mechanisms of Radiation of Fast Particles in Media	591
	Problems	605
9.3	Channeling and Radiation Emitted by Fast Particles in Crystals	609
	Problems	624
9.4	Acceleration of Particles in Turbulent Plasma Media	624
	Problems	647
9.5	Answers and Solutions	649
	Appendix: Turbulence and Its Description with the Aid of Correlation Tensors	681
	Bibliography	689
	Index	697