

Contents*

PREFACE	ix
LIST OF SYMBOLS	xi

1 Introduction

1.1 Solution of Partial Differential Equations	1
1.2 Functions Modeling the Causality Law	4
1.3 Representation of Transients	11
1.4 Inverse Processes	25
1.5 Planar Nonsinusoidal Waves	30
1.6 Nonplanar Nonsinusoidal Waves	33
1.7 Attenuation of Waves by Hysteresis Losses	36
1.8 Modified Maxwell Equations	41

2 Nonsinusoidal Waves in a Conducting Medium

2.1 Electric Step Function Excitation	44
2.2 Initial Conditions and Fourier Transform	58
2.3 Electric Exponential Ramp Function Excitation	60
2.4 Magnetic Field Due to Electric Step Function	68
2.5 Magnetic Field without Magnetic Conductivity	79
2.6 Magnetic Step Function Excitation	81
2.7 Electric Field without Magnetic Conductivity	88
2.8 Boundary Conditions with Arbitrary Time Variation	89
2.9 Magnetic Field Due to Electric Ramp Function	96
2.10 Magnetic Exponential Ramp Function Excitation	103
2.11 Boundary Conditions Using Ramp Functions	110

3 Space–Time Variation of Excitation of Waves

3.1 Propagating Excitation of Waves	115
3.2 Perpendicularly Polarized Electric Step Function	120

* Equations are numbered consecutively within each of Sections 1.1 to 6.1. Reference to an equation in a different section is made by writing the number of the section in front of the number of the equation, e.g., Eq. (2.1–50) for Eq. (50) in Section 2.1.

Illustrations and tables are numbered consecutively within each section, with the number of the section given first, e.g., Fig. 1.2-1, Table 4.2-1.

References are characterized by the name of the author(s), the year of publication, and a lowercase Latin letter if more than one reference by the same author(s) is listed for that year.

3.3	Parallel Polarized Electric Step Function	129
3.4	Magnetic Field Strength Due to Electric Step Function	131
3.5	Polarized Magnetic Step Function Excitation	135
3.6	General Propagating Boundary Conditions	138
3.7	Perpendicularly Polarized Electric Ramp Function	143
3.8	Parallel Polarized Electric Ramp Function	150
3.9	Polarized Magnetic Ramp Function Excitation	152
3.10	Propagating Boundary Conditions Using Ramp Functions	155
4	Reflection and Transmission at Boundaries	
4.1	Nonsinusoidal Waves in Nonconducting Media	159
4.2	Sinusoidal Wave Entering Conducting Medium	167
4.3	Step Function Wave Entering Conducting Medium	173
4.4	Perpendicularly Polarized Step Function Wave	178
4.5	Parallel Polarized Step Function Wave	182
4.6	Exponential Ramp Wave with Perpendicular Incidence	187
4.7	Perpendicularly Polarized Exponential Ramp Wave	192
4.8	Parallel Polarized Exponential Ramp Wave	196
4.9	Reflection-Modifying Layers on Metal Surfaces	200
4.10	Step Function Wave Leaving Conducting Medium	204
4.11	Exponential Ramp Wave Leaving Conducting Medium	210
5	Propagation Velocity of Signals	
5.1	Classical Phase and Group Velocity	215
5.2	Propagation Velocity of a Step Wave	219
5.3	Propagation of Signals	222
5.4	Propagation Velocity, Relativity, and Causality	224
5.5	Finite-Periodic Pulses	227
5.6	Magnetic Charges or Monopoles	228
6	Appendix	
6.1	Spherical Wave in a Lossy Medium	231
6.2	Notation and Formulas of Vector Analysis	233
	References and Bibliography	235
	INDEX	241