Contents

PART 1 — PEAKS OF RANDOM FUNCTIONS AND THE EFFECT OF NOISE ON RELAYS

1

The Mean Number of Peaks of a Random Function	3											
1. The Mean Number of Peaks of a Smoothly Varying Process.	4											
2. The Mean Number of Peak Clusters of a Markov												
Process	1											
3. Application of the Formula for the Mean Repe- tition Rate of Peak Clusters	17											
The Duration of Peaks of a Markov Process	21											
1. The Mean Number of Peaks of Duration Ex-												
ceeding τ	22											
2. Examples	27											
3. The Unnormalized Probability Density of the												
Peak Durations	36											
4. The Relation between the Distribution of Peak												
Durations and the Correlation Function of the												
Triggered Process	39											
5. Peaks of a Smoothed Process	43											
Supplement	45											
Smoothly Varying Noise and its Effect on Relays .	51											
1. The Distribution of Peak Durations	52											
2. Other Methods for Investigating Peaks of												
Smoothly Varying Noise	59											
3. The Area under the Peaks	68											
	 The Mean Number of Peaks of a Random Function The Mean Number of Peaks of a Smoothly Varying Process. The Mean Number of Peak Clusters of a Markov Process The Mean Number of Peak Clusters of a Markov Process Application of the Formula for the Mean Repetition Rate of Peak Clusters Application of Peaks of a Markov Process The Duration of Peaks of a Markov Process The Mean Number of Peaks of Duration Exceeding τ Examples The Unnormalized Probability Density of the Peak Durations The Relation between the Distribution of Peak Durations and the Correlation Function of the Triggered Process Seaks of a Smoothed Process Supplement The Distribution of Peak Durations The Area under the Peaks The Area under the Peaks 											

CONTENTS

	4. Effect of Pulse Signals on a Relay in the Presence	
	of Noise. The Dead Time	73
	5. Jitter of Relay Operating Time Due to the	
	Presence of Noise	80
	PART 2 NONLINEAR SELF-EXCITED	
OSC	CILLATIONS IN THE PRESENCE OF NOISE	
Chapter 4.	Basic Equations Describing the Operation of an	
	Oscillator in the Presence of Noise	87
	1. Preliminary Remarks	87
	2. An Example of a Self-Excited System. The	00
	3 Equations in Standard Form and the Simplified	50
	Equations	97
	4. Simplification of the Fluctuational Terms	105
	Supplement	113
Chapter 5.	Methods of Solving the Simplified Equations	120
	1. Amplitude Fluctuations as a Markov Process.	
	The Fokker-Planck Equation	120
	2. The Linearization Method	127
	3. The Quasi-Static Method	134
	4. Summary of the Applicability of the Various	
	Methods	141
	Supplement	144
Chapter 6.	Effect of Weak Internal Noise on an Oscillator .	147
	1. The Low Intensity of Shot Noise and the	
	Linearized Equations	148
	2. Shot Noise with Neglect of Periodic Changes of	
	Anode Current	154
	3. Periodic Nonstationarity of Shot Noise	162
	4. Influence of Amplitude Fluctuations on Phase	
	Diffusion	166

xii

CONTENTS

Chapter 7.	Effect of Strong External Noise on an Oscillator .	170									
	1. Phase Fluctuations due to Noise Applied to the										
	Inductive Branch	170									
	2. Amplitude Fluctuations due to Noise Applied to										
	the Grid Circuit	179									
	3. The Amplitude Correlation Function and the										
	Spectral Density	187									
Chapter 8.	Effect of Slowly Varying Ambient Noise on an										
	Oscillator	193									
	1. Self-Excited Oscillations in the Presence of										
	Fluctuations of Anode Voltage	195									
	2. The Correlation Function and the Spectral										
	Density of the Signal for Gaussian Frequency										
	Fluctuations.	199									
	3. Effect of Flicker Noise on the Frequency of an										
	Oscillator	203									
	4. Large Independent Phase Increments	207									
	5. Small Independent Phase Increments	210									
	6. Modulation of Self-Excited Oscillations by Noise	215									
Chapter 9.	Synchronization of an Oscillator in the Presence of										
	Noise	222									
	1. Basic Equations. Small Deviations from the										
	Synchronous Regime in the Linear Approx-										
	imation	223									
	2. The Stationary Phase Distribution and the Mean										
	Frequency	234									
	3. Large Phase Deviations and Diffusion of the										
	Number of Oscillations	247									
	4. The Case of a Large Synchronizing Signal	258									
	Supplement	273									
Chapter 10.	Parametric Oscillations	277									
	1. Linear Parametric Oscillations. The Basic Equa-										
	tions	279									

xiii

CONTENTS

	2.	Na	rrow	-Ba	nd (Qua	si-H	Iarn	nor	nic F	Para	me	tric	Osc	il-	
		lati	ons								•					282
	3.	Raj	oid 1	Para	ıme	tric	Fl	uctu	ati	ons	. Aj	opli	cati	ion	of	
		the	Stoc	chas	tic	Me	tho	đ.	•	•			•			286
	4.	Sim	ulta	neo	us F	Iar	moi	nic a	nd	Flu	ictu	atic	nal	Exe	ci-	
		tati	ons			•			a.			•	•			291
	5.	The	Aı	npli	itud	e]	Dist	ribu	tio	n.	Effe	ect	of	No	n-	
		line	arity	γ.	•	•		÷	•			•	٠			302
	6.	Par	ame	tric	Sys	sten	ns v	with	T١	vo	Bra	nch	les.	Par	a-	
		met	ric A	4mp	olifie	ers	•	·		•	•		•	•	•	305
Bibliography	ν.	• •	·	•	•	٠	•	٠	•	•	•	•	٠	٠	•	323
Index																377
A																~~~

.

xiv