668.419 TUR 2nd ed.

CONTENTS

1 The mechanical testing of plastics-a preamble **1**
1.1 The growth of materials testing 1
1.2 The growth of plastics testing 2
1.3 The rationalization of test methods for plastics 5

2 A generalized approach to mechanical testing **12**
2.1 Excitation and response 12
2.2 The mathematical representation of linear systems 14
2.3 Practical limitations on the excitation functions 26
2.4 A rational system of testing 40

3 Deformation experiments-sinusoidal excitation functions **44**
3.1 The complex modulus function 44
3.2 Free vibration experiments 45
3.3 Forced vibration experiments 48
3.4 Stress-wave propagation experiments 54
3.5 The practical utility of sinusoidal experiments 58

4 Deformation experiments-step excitation functions **62**
4.1 Introduction 62
4.2 Test methods 65
4.3 Special test routines 79

5 Deformation experiments on anisotropic systems **92**
5.1 Anisotropy in plastics 92
5.2 Formal representation of anisotropy 94
5.3 Practical testing 97
5.4 Afterthought and prelude 110

6 Strength and toughness testing-the basic concepts **112**
6.1 The general situation 112
6.2 Brittle fracture 115
6.3 Ductile failure 123
6.4 Practical implications 126

7 Short-term strength tests-ramp and impulse excitations **129**
7.1 Ramps and impulses 129
7.2 Ramp excitation tests 130
7.3 Impulse tests 139

8 Long-term strength test-step and sinusoidal excitations **155**
8.1 The system of phenomenological long-term failure tests 155
8.2 Static fatigue 159
8.3 Dynamic fatigue 168
8.4 Economic assessment of long-term durability 172

9 The sample, the specimen and the test **177**
9.1 Properties and the sample state 177
9.2 Sample preparation 179
9.3 The sample state as a test variable 181
9.4 Specimen geometry and test configuration 183