

Contents

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Preface | vii |
| Workshop on the mechanics of geomaterials | vii |
| Part 1. Modeling of asphalt | 1 |
| Chapter 1. The physical and chemical structure of asphalt: with a brief history of their usage and availability J. M. KRISHNAN, K. R. RAJAGOPAL | 5 |
| 1. What are bitumen and asphalt? | 5 |
| 2. On the abundance of bitumen in nature | 7 |
| 3. Uses of bitumen from prehistory to modern times | 8 |
| 4. Uses of bitumen in modern times | 9 |
| 5. Physical chemistry of asphalt | 13 |
| Bibliography | 29 |
| Chapter 2. The mechanical behavior of asphalt J. M. KRISHNAN | 39 |
| 1. Introduction | 39 |
| 2. Issues related to modeling of asphalt | 41 |
| 3. Modeling of asphalt | 45 |
| 4. Applications | 48 |
| 5. Conclusions | 49 |
| Bibliography | 51 |
| Chapter 3. Internal structure and modeling of asphalt mixtures E. MASAD | 57 |
| 1. Introduction | 57 |
| 2. Imaging methods for measuring the internal structure distribution | 57 |
| 3. Applications of image analysis techniques | 58 |
| 4. Summary | 64 |
| Bibliography | 65 |
| Part 2. Soil and granular materials | 69 |
| Chapter 1. Interface behaviour of soils R. G. ROBINSON | 73 |

| | |
|-----------------------------------------------------------------------------|------------|
| 1. Introduction | 73 |
| 2. Apparatus types reported in the literature | 73 |
| 3. Factors influencing interfacial friction | 75 |
| 4. Quantification of interface roughness and empirical correlations | 79 |
| 5. Limiting values of δ | 80 |
| 6. Analysis of past studies | 81 |
| 7. Effect of mode of shear on shear stress-movement curves | 82 |
| 8. Modeling of interfaces | 83 |
| 9. Looking forward | 84 |
| Bibliography | 85 |
| Chapter 2. Consolidation behaviour of reclamation fill made of lumps | |
| R. G. ROBINSON | 89 |
| 1. Introduction | 89 |
| 2. Experimental programme | 90 |
| 3. Results and discussions | 92 |
| 4. Some research issues | 98 |
| 5. Conclusions | 98 |
| Bibliography | 101 |
| Chapter 3. Modelling the behaviour of soils and granular materials | |
| I. F. COLLINS | 103 |
| 1. Historical introduction | 103 |
| 2. Material properties and experimental techniques | 106 |
| 3. Some extant theories of soil mechanics | 109 |
| 4. Thermomechanical approaches to the constitutive modelling of soils | 115 |
| 5. Conclusions | 124 |
| Bibliography | 127 |
| Part 3. Hypoelasticity and viscoelasticity | 131 |
| Chapter 1. Hypoelasticity | |
| B. BERNSTEIN | 135 |
| 1. Introduction | 135 |
| 2. Equations of hypoelasticity | 136 |
| 3. Plasticity | 137 |
| 4. Hypoelasticity | 141 |
| 5. Concluding Remarks | 144 |
| Bibliography | 145 |
| Chapter 2. Viscoelasticity | |
| B. BERNSTEIN | 147 |
| 1. Introduction | 147 |
| 2. Elastic solid | 148 |
| 3. Viscous fluid | 149 |

| | |
|--------------------|-----|
| 4. Viscoelasticity | 149 |
| 5. Energy | 150 |
| 6. General theory | 152 |
| 7. Conclusion | 154 |
| Bibliography | 155 |

Part 1

Modeling of asphalt