RAILWAY, BRIDGE AND TUNNEL ENGINEERING

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Although the first edition of this book, Atlas of Railway Engineering, was published in 1995, it has been extensively revised, updated and reorganised. The subject-matter is characterized by comprehension as well as methodical and easy-to-follow style. This edition is enhanced by widening its coverage, adding, updating and rearranging its contents. It now includes the new subject of Bridge Engineering as well as Tunnelling and Ventilation in Tunnels. This edition is divided into three sections:

SECTION I: RAILWAY ENGINEERING

1. Introduction
2. Railway Track Gauges
3. Surveys and Alignment of Railway Lines
4. Railway Track, Traction and Stresses
5. Rails
6. Sleepers
7. Ballast
8. Track Fittings
9. Resistance to Traction
10. Points and Crossings
11. Railway Stations and Yards
12. Railways and Accident Safety
13. Construction and Drainage of Railway Track
14. Maintenance, Accidents and Safety
15. Railway Track, Traction and Stress

SECTION II: BRIDGE ENGINEERING

16. Introduction
17. Bridge Foundations
18. Sub-Structures
19. Classification of Bridges
20. Bridge Flooring
21. Bridge Bearings
22. Design of Bridges
23. Construction and Erection Methods of Bridge
24. Testing, Strengthening and Maintenance of Bridges

SECTION III: TUNNEL ENGINEERING

25. General Aspects of Tunnelling
26. Alignment of Tunnel
27. Shafts and Portals
28. Tunnelling in Hard Rock
29. Tunnelling in Soft Soil
30. Tunnel Boring Machine
31. New Austrian Tunneling Method (NATM)
32. Sequential Excavation Method
33. Lighting, Ventilation and Dust Control
34. Drainage in Tunnels
35. Safety in Tunnel Construction
36. Testing, Strengthening and Maintenance of Bridges

APPENDICES

1. Abbreviated Terms
2. GTU Examination Papers
3. Index

Salient features of this book are:

- 427 Self-explanatory and neatly drawn sketches;
- 84 Illustrative problems;
- 65 Important useful tables;
- 733 Typical questions at the end of the chapters.

The text-matter has been arranged systematically according to the curriculum developed by the Gujarat Technological University (G.T.U.) for the Sixth Semester students of Civil Engineering (Subject code: 2160603) and also it should prove to be extremely useful to the Civil Engineering students preparing for the Degree Examinations of all the Indian Universities. Diploma Examinations conducted by various Boards of Technical Education, Certificate Courses as well as for the A.M.I.E., U.P.S.C., G.A.T.E., I.E.S. and other similar competitive and professional examinations. It should also prove great of interest various Boards of Technical Education, Certificate Courses as well as for the A.M.I.E., U.P.S.C., G.A.T.E., preparing for the Degree Examinations of all the Indian Universities, Diploma Examinations conducted by

About the Book

This book aims at presenting the topics of Railway, Bridge and Tunnel Engineering written in a simple manner. The subject-matter is characterized by comprehension as well as methodical and easy-to-follow style. Four new chapters have been added. Plenty of new matter, numerous examples and figures have been added as per the latest syllabus of different universities of India. Aspects of Tunnelling

The Section I: Railway Engineering is well divided in to Fifteen chapters including Introduction, Railway Track Gauges, Surveys and Alignment of Railway Lines, Railway Track, Traction and Stresses, Rails, Sleepers, Ballast, Track Fittings, Geometric Design of A Track, Resistance to Traction, Points and Crossings, Railway Stations and Yards, Signalling and Interlocking, Construction and Drainage of Railway Track, Maintenance, Accidents and Safety.

The Section II: Bridge Engineering is well divided in to Nine chapters including Introduction, Bridge Foundations, Sub-Structures, Classification of Bridges, Bridge Flooring, Bridge Bearings, Design of Bridges, Construction and Erection Methods of Bridge, Testing, Strengthening and Maintenance of Bridges.


The Appendix I gives Abbreviated Terms and Appendix II gives six solved examination papers of GTU.
SECTION 1: RAILWAY ENGINEERING

CHAPTER 1 INTRODUCTION

1-1. Brief history of railways

1-2. Importance of railways
   (1) General
   (2) Characteristics of railways
   (3) Advantages of railways

1-3. Trends in modern railways

1-4. Monorail
   (1) General
   (2) Applications and advantages of monorails
   (3) Mumbai Monorail System
   (4) Monorail and Maglev

1-5. Trains of tomorrow (Maglev Trains)

1-6. Automatic train operation

1-7. Indian railways

1-8. Development of the Indian railway
   (1) The old guarantee system
   (2) State construction and ownership
   (3) The modified guarantee system
   (4) Nationalisation
   (5) Integration and regrouping

1-9. Tourism development in Indian Railways

1-10. Bot and bolt projects of indian railways

1-11. Organizational structure of Indian Railways

1-12. Public undertakings of indian railways

1-13. Classification of Indian Railways
   (1) Trunk routes
   (2) Main lines
   (3) Branch Lines

1-14. Achievements of Indian Railways

1-15. Future Plan Of Indian Railways

1-16. Training Institutions Of The Indian Railways

1-16-1. The Railway Staff College, Vadodara

1-16-2. Indian Railways Institute of Civil Engineering (IRICEN), Pune

1-16-3. Indian Railways Institute of Signal Engineering and Tele-communications (IRISET), Secunderabad

1-16-4. Indian Railways Institute of Mechanical and Electrical Engineering, Jamalpur

1-16-5. Institute for Signal and Civil Engineering Officers at South Lallaguda, Secunderabad

1-16-6. Indian Railways Institute of Electrical Engineering (IRIEEN), Nasik

1-16-7. Indian Railways Institute of Transport Management (IRITM), Lucknow

1-16-8. Jagjivan Ram Railway Protection Force Academy, Lucknow

1-16-9. Railway University, Vadodara

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2-2. Factors affecting the choice of a gauge
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   (2) Development of poor areas
   (3) Cost of track
   (4) Speed of movement
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   (2) Standard gauge
   (3) Metre gauge
   (4) Narrow gauge
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   (1) Problems caused by change of gauge or break of gauge
   (i) Difficulties to passengers
   (ii) Difficulties for sending goods
   (iii) Inefficient use of rolling stock
   (iv) Difficulty in war
   (v) Equipment at station
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3-3. Requirements Of An Ideal Alignment
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   (2) Economic considerations
   (3) Safety and comfort
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   (5) Integrated development
   (6) Aesthetic aspects

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   (2) Importance of reconnaissance survey
   (3) Information gathered in reconnaissance survey
   (4) Factors to be kept in view during reconnaissance survey
   (5) Instruments for reconnaissance survey

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   (1) Object of preliminary survey
   (2) Importance of preliminary survey
   (3) Work of preliminary survey
   (4) Instruments for preliminary survey

3-4-3. Location survey
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   (2) Importance of location survey
   (3) Work of location survey
   (4) Instruments for location survey

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   (2) Foot by foot survey

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   (4) Sub ballast
   (5) Embankment
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   (3) Forces acting on the railway track
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   (2) Longitudinal stresses
   (3) Contact shear stresses between rail and wheel
   (4) Extra stresses
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   (2) Relief of stress
   (3) Permissible stresses on a rail section
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   (3) Reduction of expansion gap
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   (3) Construction of branch lines
   (4) Bending of rails
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   (1) Crushed head
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   (5) Square or angular breaks
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   (7) Hogged rails
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   (2) Wave action or wave theory
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   (2) Conditions applied to design the steel sleepers
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   (3) Firm embankments or river banks
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   (7) Minimum obstruction to waterway
   (8) Right-angle (square) crossing
   (9) Scouring and silting
   (10) Straight stretch of river
   (11) Velocity of flow
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