

Problem 01

Given:

Length of bar = L

Cross-sectional area = A

Unit mass = ρ

The bar is suspended vertically from one end

→ **Required:**

Show that the total elongation $\delta = \rho g L^2 / 2E$.

If total mass is M, show that $\delta = MgL/2AE$

Solution:

$$\delta = \frac{PL}{AE}$$

From the figure:

$$\delta = d\delta$$

$$P = Wy = (\rho Ay)g$$

$$L = dy$$

$$d\delta = \frac{(\rho Ay)g dy}{AE}$$

$$\delta = \frac{\rho g}{E} \int_0^L y dy = \frac{\rho g}{E} \left[\frac{y^2}{2} \right]_0^L$$

$$\delta = \frac{\rho g}{2E} [L^2 - 0^2]$$

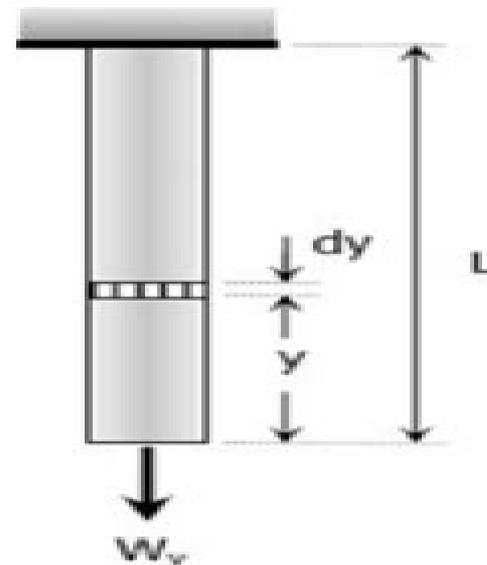
$$\delta = \rho g L^2 / 2E \text{ ok!}$$

Given the total mass M

$$\rho = M/V = M/AL$$

$$\delta = \frac{\rho g L^2}{2E} = \frac{M}{AL} \cdot \frac{gL^2}{2E}$$

$$\delta = \frac{MgL}{2AE} \text{ ok!}$$



Strength Of Materials A Problem Approach

David Egerton (M.Sc.)



Strength Of Materials A Problem Approach:

Strength of Materials David Egerton (M.Sc.),1980 *Solution Manual for Mechanics of Materials* ,1952 Applied Statics and Strength of Materials Leonard Spiegel,George F. Limbrunner,2004 The fourth edition of Applied Statics and Strength of Materials presents an elementary analytical and practical approach to the principles and physical concepts of statics and strength of materials It is written at an appropriate mathematics level for engineering technology students using algebra trigonometry and analytic geometry A knowledge of calculus is not required for understanding the text or for working the problems The book is intended primarily for use in two year or four year technology programs in engineering construction or architecture Much of the material has been classroom tested in our Accreditation Board for Engineering and Technology ABET accredited engineering technology programs as well as in our American Council for Construction Education ACCE accredited construction technology program The text can also serve as a concise reference guide for undergraduates in a first Engineering Mechanics Statics and or Strength of Materials course in engineering programs Although written primarily for the technology student it could also serve as a valuable guide for practicing technologists and technicians as well as for those preparing for state licensing exams for professional registration in engineering architecture or construction The emphasis of the book is on the mastery of basic principles since it is this mastery that leads to successful solutions of real life problems This emphasis is achieved through abundant worked out examples a logical and methodical presentation and a topical selection geared to student needs The problem solving method that we emphasize is a consistent comprehensive step by step approach The principles and applications both examples and problems presented are applicable to many fields of engineering technology among them civil mechanical construction architectural industrial and manufacturing This fourth edition was prepared with the objective of updating the content where necessary and rearranging and revising some of the material to enhance the teaching aspects of the text While the primary unit system remains the U S Customary System metric SI units continue to be used throughout the text and the examples and problems reflect a mix of the two measurement systems The homework problem sets have some additions and some deletions and some other problems were revised The book includes the following features Each chapter is written to introduce more complex material gradually Problems are furnished at the end of each chapter and are grouped and referenced to a specific section These are then followed by a group of supplemental problems provided for review purposes Generally problems are arranged in order of increasing difficulty A summary at the end of each chapter presents a thumbnail sketch of the important concepts presented in the chapter Useful tables of properties of areas and conversion factors for U S Customary SI conversion are printed inside the covers for easy access Most chapters contain computer problems following the section problems These problems require students to develop computer programs to solve problems pertinent to the topics of the chapter Any appropriate computer software may be used The computer problems are another tool with which to reinforce students

understanding of the concepts under consideration Answers to selected problems are provided at the back of the text The primary unit system in this book remains the U S Customary system SI however is fully integrated in both the text and the problems This is a time of transition between unit systems Much of the new construction work in the public sector particularly in the transportation field now uses metric SI measurement full conversion to SI in the technology field in the United States is inevitable and will undoubtedly occur eventually Technicians and technologists must be familiar with both systems To make the book self contained design and analysis aids are furnished in an extensive appendix section Both U S Customary and SI data are presented Calculus based proofs are introduced in the appendices The Instructor s Manual includes complete solutions for all the end of chapter problems in the text There is sufficient material in this book for two semesters of work in statics and strength of materials In addition by selecting certain chapters topics and problems the instructor can adapt the book to other situations such as separate courses in statics or mechanics and strength of materials Thanks are extended to many colleagues associates and students who with their enthusiastic encouragement insightful comments and constructive criticisms have helped with the input for this edition A special word of thanks goes to James F Limbrunner P E for his contributions to the text and help with proofreading and problem sets Also appreciation is extended to the reviewers for this edition for their help and constructive suggestions Elliot Colchamiro New York City Technical College and Dorey Diab Stark State College And last my thanks to Jane Limbrunner for her support patience and understanding during the term of this project George F Limbrunner

Applied Strength of Materials Robert L. Mott, Joseph A. Untener, 2021-07-04 This text is an established bestseller in engineering technology programs and the Seventh Edition of Applied Strength of Materials continues to provide comprehensive coverage of the mechanics of materials Focusing on active learning and consistently reinforcing key concepts the book is designed to aid students in their first course on the strength of materials Introducing the theoretical background of the subject with a strong visual component the book equips readers with problem solving techniques The updated Seventh Edition incorporates new technologies with a strong pedagogical approach Emphasizing realistic engineering applications for the analysis and design of structural members mechanical devices and systems the book includes such topics as torsional deformation shearing stresses in beams pressure vessels and design properties of materials A big picture overview is included at the beginning of each chapter and step by step problem solving approaches are used throughout the book FEATURES Includes the big picture introductions that map out chapter coverage and provide a clear context for readers Contains everyday examples to provide context for students of all levels Offers examples from civil mechanical and other branches of engineering technology Integrates analysis and design approaches for strength of materials backed up by real engineering examples Examines the latest tools techniques and examples in applied engineering mechanics This book will be of interest to students in the field of engineering technology and materials engineering as an accessible and understandable introduction to a complex field

Engineering Methods for the Design and Selection of Materials Against Fracture E. T. Wessel, W. G. Clark, 1966

Current Methods of Fracture-toughness Testing of High-strength Alloys with Emphasis on Plane Strain J. E.

Campbell, 1964 Fracture toughness testing using principles of fracture mechanics has developed to the point where it can be used as a basis for selection of materials for estimating limiting design stresses assuming the presence of small flaws and for analyzing failures Current methods of measuring plane stress and plane strain fracture toughness parameters are presented in this report The specimens include center cracked edge cracked single edge cracked surface cracked and notched round bars which are subjected to tensile loading and notched bars for bend tests The different types of specimens permit evaluating sheet plate bar stock and forgings as well as material from failed structures Application of fracture toughness parameters to design of high strength structures is reviewed for both static and fatigue loading Consideration of the fracture mechanics concepts in design should lead to fewer problems with brittle fracture in high strength structures Author

Recommendations and Evaluations of Materials-research Areas of Importance to Missile and Space Vehicle Structures

Jack B. Esgar, 1963 **Strength Of Materials: A Practical Approach (vol. I)** Prakash D.S. Rao, 2017 The theoretical as well as practical aspects of the strength of materials are presented in this book in a systematic way to enable students to understand the basic principles and prepare themselves for the tasks of designing large structures subsequently The system of units notation and conventions are explained clearly along with a brief historical review of the developments in structural mechanics **NASA Technical Note**, 1964 **Architectural Engineering: New Concepts, New Methods, New**

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