Example of Static Equilibrium

Balancing a leaning beam:

$F_h - T_c = 0 \quad \Rightarrow F_h = T_c$

$F_v = 5047\ \text{N}$

$F_v - Mg - mg = 0 \quad \Rightarrow F_v - 515g = 0$

$aT_c - bMg - \frac{b}{2}mg = 0 \quad (3)$

$\Rightarrow 1.9T_c - 2.5 \cdot 430g - \frac{2.5}{2} \cdot 85g = 0 \quad (3)$

Say, M = 430 kg, m = 85 kg, a = 1.9 m, b = 2.5 m

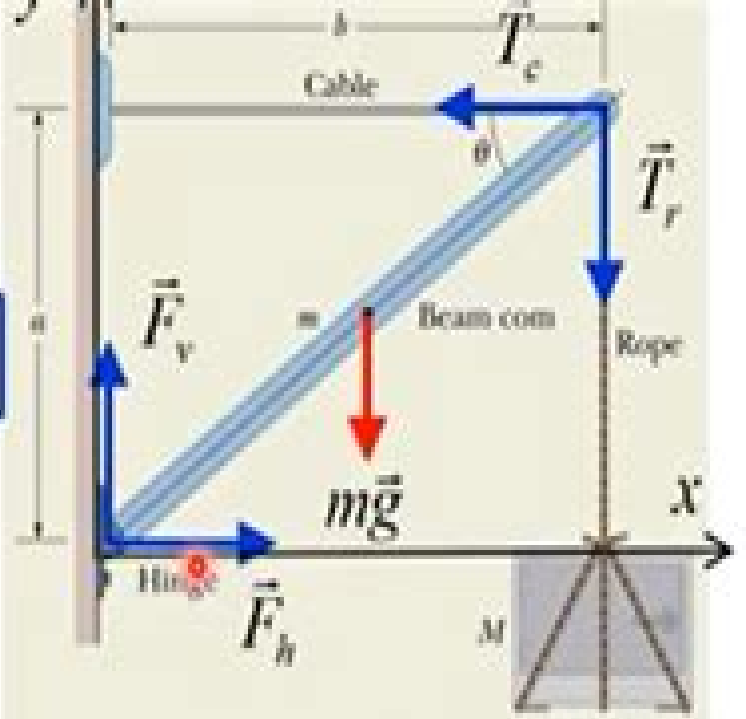
From (3): $1.9T_c = 10535 + 1041.25$

$\therefore T_c = 6100\ \text{N}$

$\therefore F_h = 6100\ \text{N}$

$F = \sqrt{F_h^2 + F_v^2} =$

$= \sqrt{6100^2 + 5047^2} = 7917\ \text{N}$



Be sure to attend the recitations this week for practice!

Static Equilibrium Problems And Solutions

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Static Equilibrium Problems And Solutions:

Kinematics, Dynamics, and Design of Machinery Kenneth J. Waldron,Gary L. Kinzel,Sunil K. Agrawal,2016-09-20 Kinematics Dynamics and Design of Machinery Third Edition presents a fresh approach to kinematic design and analysis and is an ideal textbook for senior undergraduates and graduates in mechanical automotive and production engineering Presents the traditional approach to the design and analysis of kinematic problems and shows how GCP can be used to solve the same problems more simply Provides a new and simpler approach to cam design Includes an increased number of exercise problems Accompanied by a website hosting a solutions manual teaching slides and MATLAB programs **MATLAB Essentials: Symbolic and Numeric Problem-Solving in Engineering** Lester W. Schmerr, Jr.,2025-11-19 This book introduces MATLAB as a direct problem solving tool where the many built in functions and commands of MATLAB can be used to perform even complex tasks In this mode MATLAB acts as a very advanced scientific calculator The primary purpose of this book is to teach the reader how to use the functions and commands of this calculator and when necessary how to save the problem solving steps so that the solution obtained can be re used or re evaluated under different conditions The book also introduces symbolic calculations extensively in addition to the traditional numerical methods found in other texts MATLAB was initially introduced as a numerical tool for linear algebra problems and over the years has extended those numerical capabilities significantly to many areas of science and engineering Consequently it is not surprising that most books retain a strong emphasis on numerical solutions and treat symbolic calculations only briefly if at all A key point is that while symbolic algebra can be used to solve problems symbolically it can also be used to make the formulation of problems much simpler even if the ultimate solution is found numerically Recognizing and demonstrating this important property of symbolic calculations is unique to this book Examines symbolic and numeric MATLAB tools with engineering examples of linear and nonlinear equations eigenvalue problems and differential equations *A Unified Approach to the Finite Element Method and Error Analysis Procedures* Julian A. T. Dow,1998-11-09 A Unified Approach to the Finite Element Method and Error Analysis Procedures provides an in depth background to better understanding of finite element results and techniques for improving accuracy of finite element methods Thus the reader is able to identify and eliminate errors contained in finite element models Three different error analysis techniques are systematically developed from a common theoretical foundation 1 modeling erros in individual elements 2 discretization errors in the overall model 3 point wise errors in the final stress or strain results Thoroughly class tested with undergraduate and graduate students A Unified Approach to the Finite Element Method and Error Analysis Procedures is sure to become an essential resource for students as well as practicing engineers and researchers New simpler element formulation techniques model independent results and error measures New polynomial based methods for identifying critical points New procedures for evaluating sheer strain accuracy Accessible to undergraduates insightful to researchers and useful to practitioners Taylor series polynomial based Intuitive elemental and

point wise error measures Essential background information provided in 12 appendices *Micromechanics of Granular Materials* Bernard Cambou,Michel Jean,Farhang Radjaï,2013-03-01 Micromechanics of Granular Materials Nearly all solids are compised of grains However most studies treat materials as a continious solid The book applies analysis used on loose granular materials to dense grainular materials This title s main focus is devoted to static or dynamic loadings applied to dense materials although rapid flows and widely dispersed media are also mentioned briefly Three essential areas are covered Local variable analysis Contact forces displacements and rotations orientation of contacting particles and fabric tensors are all examples of local variables Their statistical distributions such as spatial distribution and possible localization are analyzed taking into account experimental results or numerical simulations Change of scales procedures Also known as homogenization techniques these procedures make it possible to construct continuum laws to be used in a continuum mechanics approach or performing smaller scale analyses Numerical modeling Several methods designed to calculate approximate solutions of dynamical equations together with unilateral contact and frictional laws are presented including molecular dynamics the distinct element method and non smooth contact dynamics Numerical examples are given and the quality of numerical approximations is discussed Schaum's Outline of Statics and Strength of Materials John H. Jackson,Harold G. Wirtz,1983-05-22 Review of basic topics in units dimensional analysis math and vector analysis *Industrial Engineering and the Engineering Digest* ,1907 Climbing and Walking Robots and the Supporting Technologies for Mobile Machines G. Muscato,D. Longo,2003-11-07 Bringing together academics researchers and industrialists Climbing and Walking Robots 2003 CLAWAR 2003 provides a forum for cross fertilization in the different specialities so that both state of the art and industrial applications can be reported on Original contributions both industrial and those in new emerging fields provide a full picture of climbing and walking robots The interest in climbing and walking robots CLAWAR has increased considerably over recent years addressing many application fields such as exploration intervention in extreme environments personal services emergency rescue operations transportation entertainment etc and envisage humanoid robots evolving into mechatronic replicas of ourselves Topics covered include Biological Inspired Systems Medical Systems Control of CLAWAR Design Methodology System Modelling and Simulation Modularity and System Architecture Gait Generation and Stability of CLAWAR Biped Locomotion Multi legged Locomotion Micro Machines Applications Climbing Robots Actuators Sensors Navigation and Sensors Fusion CLAWAR Network Workpackages **The Finite Element Method: Solid mechanics** O. C. Zienkiewicz,Robert Leroy Taylor,2000 **Wcs Kinematics Chapters 1-6** Kenneth J. Waldron,2001 **Viscoelastic Modeling for Structural Analysis** Jean Salençon,2019-04-29 The theory of viscoelasticity has been built up as a mechanical framework for modeling important aspects of the delayed behavior of a wide range of materials This book primarily intended for civil and mechanical engineering students is devoted specifically to linear viscoelastic behavior within the small perturbation framework The fundamental concepts of viscoelastic behavior are first

presented from the phenomenological viewpoint of the basic creep and relaxation tests within the simple one dimensional framework The linearity and non ageing hypotheses are introduced successively with the corresponding expressions of the constitutive law in the form of Boltzmann s integral operators and Riemann s convolution products respectively Applications to simple quasi static processes underline the dramatic and potentially catastrophic consequences of not taking viscoelastic delayed behavior properly into account at the design stage Within the three dimensional continuum framework the linear viscoelastic constitutive equation is written using compact mathematical notations and takes material symmetries into account The general analysis of quasi static linear viscoelastic processes enhances similarities with and differences from their elastic counterparts Simple typical case studies illustrate the importance of an in depth physical understanding of the problem at hand prior to its mathematical analysis **Technical Literature** Harwood Frost,Charles MacCaughey Same,1907 Each number includes section Index to technical articles in current periodical literature Jan Mar 1907 Index to current technical literature **The Engineering Digest** Harwood Frost,Charles MacCaughey Sames,1907

Proceedings American Society for Engineering Education. Conference,1995 **Mechanics of Materials** Roy R. Craig, Jr.,Eric M. Taleff,2020-08-07 The fourth edition of Mechanics of Materials is an in depth yet accessible introduction to the behavior of solid materials under various stresses and strains Emphasizing the three key concepts of deformable body mechanics equilibrium material behavior and geometry of deformation this popular textbook covers the fundamental concepts of the subject while helping students strengthen their problem solving skills Throughout the text students are taught to apply an effective four step methodology to solve numerous example problems and understand the underlying principles of each application Focusing primarily on the behavior of solids under static loading conditions the text thoroughly prepares students for subsequent courses in solids and structures involving more complex engineering analyses and Computer Aided Engineering CAE The text provides ample fully solved practice problems real world engineering examples the equations that correspond to each concept chapter summaries procedure lists illustrations flow charts diagrams and more This updated edition includes new Python computer code examples problems and homework assignments that require only basic programming knowledge **Mechanics of Solids** ,1971 *Mechanics of Materials* Roy R. Craig,1996-02-16 This book emphasizes that all proems in mechanics of deformable bodies involve three key ingredients equilibrium constitutive behavior of materials and geometry of deformation **The Theory and Practice of Modern Framed Structures: Statically indeterminate structures and secondary stresses** Frederick Eugene Turneaure,John Butler Johnson,Charles Walter Bryan,William Spaulding Kinne,1929 **The Theory and Practice of Modern Framed Structures** John Butler Johnson,Charles Walter Bryan,Frederick Eugene Turneaure,1929 **The Theory and Practice of Modern Framed Structures: Statically indeterminate structures and secondary stresses** John Butler Johnson,1929

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