

SOLUTION

1. Mass, stiffness, and natural period of the SDOF system: Since we assumed the beam to be rigid, the stiffness of the system is given by the sum of column lateral stiffnesses. The mass and stiffness of the SDOF system are calculated as follows:

Mass,

$$m = \frac{W}{g} = \frac{1500 \text{ lbs}}{386.4 \text{ in/s}^2} = 3.88 \text{ lb-s}^2/\text{in}$$

Stiffness (see [Table 3.1](#)), when both columns are fixed-pinned,

$$k = \frac{12EI}{d^3} = \frac{12EI}{d^3} = 2 \left(\frac{3.29(1000)(1000 \text{ psi})(75 \text{ in}^4)}{(12.5 \text{ ft} \times 12 \text{ in/ft})^3} \right) = 22,374 \text{ lb/in}$$

The natural period of the system is

$$T_n = 2\pi \sqrt{\frac{m}{k}} = 2\pi \sqrt{\frac{3.88 \text{ lb-s}^2/\text{in}}{22,374 \text{ lb/in}}} = 0.262 \text{ s}$$

2. Determine the maximum displacement for ductility of 4, u_m : First determine A due to an 84.7% design spectrum, scaled to 0.5g PGCA, by entering the response spectrum in [Figure 3.22](#) with $T_n = 0.26 \text{ s}$, which is in the acceleration-sensitive region,

$$A = a = 2.7 \text{ lg} = 0.5(2.7 \text{ lg}) = 1.335 \text{ g}$$

The maximum displacement is computed using Equation 5.28 and [Figure 5.18](#),

$$u_m = \mu \left(\frac{T_n}{2\pi} \right)^2 A = \mu \left(\frac{T_n}{2\pi} \right)^2 \frac{A}{\sqrt{2\mu - 1}} = 4 \left(\frac{0.262 \text{ s}}{2\pi} \right)^2 \frac{1.335(386.4 \text{ in/s}^2)}{\sqrt{2(4) - 1}} = 1.353 \text{ in}$$

3. Determine the required column strength for a ductility of 4, P_u : To determine P_u , use $A = 1.335 \text{ g}$ and Equation 5.29,

$$P_u = m\ddot{u}_m = \frac{m A}{\sqrt{2\mu - 1}} = \frac{3.88 \text{ lb-s}^2/\text{in}(1.335)(386.4 \text{ in/s}^2)(4)}{\sqrt{2(4) - 1}} = 770 \text{ lbs}$$

PROBLEMS

- 5.1 Use the MATLAB script provided in [Chapter 4](#), Example 4.13 to draw response spectra for the displacement, velocity, and acceleration for an SDOF system subjected to the 1994 Northridge earthquake ground acceleration for 2%, 5%, and 10% damping.
- 5.2 The building frame shown is subjected to the El Centro earthquake; determine the total stiffness, structural period, deflection of the beam, base shear, and bending stresses in each of the columns. The roof weighs 10 kips and the substructure has 5% damping, modulus of elasticity, $E = 29,000 \text{ ksi}$, and the other geometric properties shown.

Solutions Manual For The Dynamics Of Heat

Royal Society of Arts (Great Britain)



Solutions Manual For The Dynamics Of Heat:

Solutions Manual for The Dynamics of Heat Hans U. Fuchs, 2012-12-06 This manual contains detailed solutions of slightly more than half of the end of chapter problems in The Dynamics of Heat The numbers of the problems included here are listed on the following page A friend who knows me well noticed that I have included only those problems which I could actually solve myself Also to make things more interesting I have built random errors into the solutions If you find any of them please let me know Also if you have different ways of solving a problem I would be happy to hear from you Any feedback also on the book in general would be greatly appreciated There is an Errata sheet for the first printing of The Dynamics of Heat By the time you read this it should be available on the Internet for you to download A reference to the URL of the sheet can be found in the announcement of my book on Springer's WWW pages www.springer-ny.com Winterthur 1996 Hans Fuchs vi Numbers of Problems Solved Prologue 1 2 4 5 6 8 12 13 17 19 23 25 27 30 32 33 34 38 39 40 42 44 47 49 50 53 55 60 61 62 Chapter 1 2 4 5 8 9 11 13 15 16 17 18 20 21 24 26 27 29 31 33 34 37 39 41 42 44 45 47 49 51 53 55 57 58 60 62 Chapter 2 1 3 5 6 7 9 10 12 14 15 16 17 19 20 22 23 24 26 27 29 30 32 33 36 37 38 41 42 46 47 49 Interlude 2 3 4 5 6 8 10 11 12 13 18 19 20 21 23 24 28 Chapter 3 2 4 6 8 10 12 15 16 17 18 22 24 25 28 30 31 35 36 Chapter 4 1 2 4 6 8 9 11 12 13 15 18 20 21 22 25 27 28 29 30 31 33 34 35 39 40 43 44 46 Epilogue 1 2 11 PROLOGUE Solutions of Selected Problems 2 PROLOGUE Problem 1 Calculate the hydraulic capacitance of a glass tube used in a mercury pressure gauge The inner diameter of the tube is 8.0 mm *Introduction to Thermal Sciences* Frank W. Schmidt, 1993-01-04 *Introduction to Experimental Methods* Terry W. Armstrong, 2023-07-31 Introduction to Experimental Methods succinctly explains fundamental engineering concepts in mechanics dynamics heat transfer and fluid dynamics From conceptualizing an engineering experiment to conducting a comprehensive lab this book enables students to work through the entire experimental design process Offering a complete overview of instruction for engineering lab methodology the book includes practical lab manuals for student use directly complementing the instruction Numerous worked examples and problems are presented along with several hands on experiments in individual lab manuals This book discusses how to write lab reports how to configure a variety of instruments and equipment and how to work through failures in experimentation Introduction to Experimental Methods is intended for senior undergraduate engineering students taking courses in Experimental Methods Instructors will be able to utilize a Solutions Manual for their course Features Provides an overview of experimental methods in mechanics dynamics heat transfer and fluid dynamics Covers design of experiments instruments and statistics Discusses SolidWorks and PASCO Capstone software Includes numerous end of chapter problems and worked problems Features a Solutions Manual for instructor use **Design of Thermal Energy Systems** Pradip Majumdar, 2021-06-01 Design of Thermal Energy Systems Pradip Majumdar Northern Illinois University USA A comprehensive introduction to the design and analysis of thermal energy systems Design of Thermal Energy Systems covers the fundamentals and applications in thermal

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Engineer in Training Dilip K. Das, Rajaram K. Prabhudesai, 2004 Annotation The PM exam for the FE is discipline specific Engineer in Training Chemical Review 2nd Ed prepares chemical engineers for this portion of the exam Students will want to buy Fundamentals of Engineering Examination Review for the AM portion of the exam EIT Industrial Review Donovan Young, 2003-09-18 This guide is written for the afternoon FE EIT Industrial Exam and reviews each topic with numerous example problems and complete step by step solutions End of chapter problems with solutions and a complete sample exam with solutions are provided Topics covered Production Planning and Scheduling Engineering Economics Engineering Statistics Statistical Quality Control Manufacturing Processes Mathematical Optimization and Modeling Simulation Facility Design and Location Work Performance and Methods Manufacturing Systems Design Industrial Ergonomics Industrial Cost Analysis Material Handling System Design Total Quality Management Computer Computations and Modeling Queuing Theory and Modeling Design of Industrial Experiments Industrial Management Information System Design Productivity Measurement and Management 101 problems with complete solutions SI Units **Computational Fluid Dynamics - Analysis, Simulations, and Applications** Mahboub Baccouch, 2025-02-26 This book comprehensively explores numerical methods and their applications across diverse fields strongly focusing on computational fluid dynamics CFD and advanced modeling techniques Starting with numerical approaches for solving the viscous and inviscid Burgers equations establishes a foundation for understanding complex fluid dynamics Subsequent chapters delve into cutting edge topics including Large Eddy Simulations LES for turbulence modeling heat transfer analysis and the influence of working fluids on vortex dynamics in industrial pipelines The book also explores emerging areas such as nanoscale simulations plasmonic excitations and biomedical applications like hemodynamics in atrial fibrillation Real world case studies and practical examples demonstrate the versatility of CFD in addressing challenges in engineering biology and energy systems This book combines theoretical rigour with practical insights and is designed for advanced undergraduate and graduate students researchers and professionals It bridges the gap between numerical theory and real world applications providing readers with the tools to solve complex problems across various scientific and engineering domains Whether you're looking to deepen your understanding of numerical methods enhance your CFD expertise or explore innovative applications this book is a valuable resource for gaining actionable insights and fostering innovation in computational modeling *Catalog of Copyright Entries. Third Series* Library of Congress. Copyright Office, 1965 Includes Part 1 Number 2 Books and Pamphlets Including Serials and Contributions to Periodicals July December Fuel Cell Engines Matthew M. Mench, 2008-03-07 Fuel Cell Engines is an introduction to the fundamental principles of electrochemistry thermodynamics kinetics material science and transport applied specifically to fuel cells It covers scientific fundamentals and provides a basic understanding that enables proper technical decision making *Applied Mechanics Reviews*, 1992 **Essentials of Micro- and Nanofluidics** A. Terrence Conlisk, 2013 This book introduces students to the basic physical principles to analyze fluid flow in

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