SOLUTIONS MANUAL

TO

ACCOMPANY

ELEMENTARY HYDRAULICS

James F. Cruise
Department of Civil and Environmental Engineering
University of Alabama at Huntsville
Huntsville, AL 35899, U.S.A.

Mohsen M. Sherif
Department of Civil and Environmental Engineering
United Arab Emirates University
Al-Ain, UAE

and

Vijay P. Singh
Department of Biological and Agricultural Engineering
Texas A & M University
Scoates Hall, 2117 TAMU
College Station, Texas 77843-2117

Dedicated to our families

James F. Cruise: To my mother, Lula Grace Cruise Mohsen M. Sherif: To Hala, Muhammad, and Mai

Vijay P. Singh: To Anita, Vinay, and Arti

Contents

	Page
Chapter 1. Introduction	1
Chapter 2. Fluid Properties	9
Chapter 3. Forces, Motions and Energy	25
Chapter 4. Hydrostatics	33
Chapter 5. Governing Equations	53
Chapter 6. Dimensional Analysis and Hydraulic Similarity	81
Chapter 7. Flow Resistance and Velocity Distributions	113
Chapter 8. Closed Conduit Flow	129
Chapter 9. Pumps	161
Chapter 10. Channel Geometry	177
Chapter 11. Resistance in Open Channels	187
Chapter 12. Energy Principles in Open Channels	201
Chapter 13. Momentum Principles in Open Channels	223
Chapter 14. Gradually Varied Flow	243
Chapter 15. Computation of Water Surface Profiles	261
Chapter 16. Design of Hydraulic Controls and Structures	297

PREFACE

This instructor solutions manual has been prepared to accompany the text "Elementary Hydraulics" by James F. Cruise, Mohsen M. Sherif and Vijay P. Singh, Thomson, 2007. Contained in the manual are solutions of all the end-of-chapter problems. The solutions are given step by step and illustrated through graphs and tables when deemed necessary, with the objective of aiding the reader to easily understand the subject matter of the text.

In preparation of the manual, the authors received help form a number of people: Dr. Anvar Kacimov, Dr. Khaled Hamza and Eng. Roohe Zafar. Mr. Mohamed Shahid typed several sections of the manual. All the Figures were drafted by Mr. Hamdi Kandil. To all of these people goes the authors' gratitude. Without their support the manual would not have been completed in the current form.

Although every effort has been made to check each solution, there may still remain errors or typos. The authors would be appreciative of being informed of any errors or omissions discovered by the readers.

May 2006

James F. Cruise, Huntsville, Alabama Mohsen M. Sherif, Al-Ain, United Arab Emirates Vijay P. Singh, College Station, Texas