Introduction

ABOUT THIS BOOK

Six-Minute Solutions for Civil PE Exam Water Resources and Environmental Depth Problems is organized into nine chapters. Each chapter contains problems that correspond to the format and scope that would be expected to appear in the civil PE exam’s water resources and environmental depth section.

Most of the problems are quantitative, requiring calculations to arrive at a correct solution. A few are non-quantitative. Some problems will require a little more than 6 minutes to answer, and others require a little less. On average, during the exam you should expect to complete 80 problems in 480 minutes (8 hours), or spend 6 minutes per problem.

The solutions are presented in a step-by-step sequence to help you follow the logical development of the correct solution and to provide examples of how you may want to approach your solutions as you take the PE exam.

Each problem includes a hint to provide direction in solving the problem. In addition to the correct solution, you will find an explanation of the faulty solutions leading to the three incorrect answer options. The incorrect options are intended to represent common mistakes specific to different problem types. These may be simple mathematical errors, such as failing to square a term in an equation, or more serious errors, such as using the wrong equation.

Though you will not encounter problems on the exam exactly like those presented in this book, reviewing these problems and solutions will increase your familiarity with the exam problems’ format, content, and solution methods. This preparation will help you considerably during the exam.

EXAM FORMAT

The civil PE exam is divided into two four-hour sessions, with each session containing 40 multiple-choice problems. Only one of the four options given is correct, and the problems are completely independent of each other.

The morning section of the civil PE exam is a “breadth” exam covering eight areas of general civil engineering knowledge: project planning, means and methods, soil mechanics, structural mechanics, hydraulics and hydrology, geometrics, materials, and site development. All examinees take the same morning exam.

Examinees must choose one of the five afternoon exam sections: construction, geotechnical, structural, transportation, or water resources and environmental. The water resources and environmental depth section is intended to assess your knowledge of water resources and environmental engineering principles and practice. The topics and approximate distribution of problems for the water resources and environmental depth section are as follows.

1. Analysis and Design (4 questions): Mass balance; hydraulic loading; solids loading; hydraulic flow measurement
2. Hydraulics—Closed Conduit (5 questions): Energy and/or continuity equation; pressure conduit; pump application and analysis, including wet wells, lift stations, and cavitation; pipe network analysis
3. Hydraulics—Open Channel (5 questions): Open-channel flow; hydraulic energy dissipation; stormwater collection and drainage; subcritical and supercritical flow
4. Hydrology (7 questions): Storm characteristics; runoff analysis; hydrograph development and applications, including synthetic hydrographs; rainfall intensity, duration, and frequency; time of concentration; rainfall and stream gauging stations; depletions; stormwater management
5. Groundwater and Wells (3 questions): Aquifers; groundwater flow; well analysis—steady state
6. Wastewater Collection and Treatment (6 questions): Wastewater collection systems; wastewater treatment processes; wastewater flow rates; preliminary treatment; primary treatment; secondary treatment; nitrification/denitrification; phosphorus removal; solids treatment, handling, and disposal; digestion; disinfection; advanced treatment
7. Water Quality (3 questions): Stream degradation; oxygen dynamics; total maximum daily load (TMDL); biological contaminants; chemical contaminants, including bioaccumulation
8. Drinking Water Distribution and Treatment (6 questions): Drinking water distribution systems; drinking water treatment processes; demands; storage; sedimentation; taste and odor control; rapid mixing; flocculation; filtration; disinfection, including disinfection byproducts; hardness and softening
HOW TO USE THIS BOOK

To optimize your study time and obtain the maximum benefit from these problems, consider the following suggestions.

1. Complete an overall review of the problems, and identify the subjects that you are least familiar with. Work a few of these problems to assess your general understanding of the subjects and to identify your strengths and weaknesses.

2. Locate and organize relevant resource materials. (See the References section in this book as a starting point.) As you work problems, some of these resources will emerge as more useful to you than others. These are what you will want to have on hand when taking the PE exam.

3. Work the problems in one chapter at a time, starting with the subject areas that you have the most difficulty with.

4. When possible, work problems without utilizing the hints. Always attempt your own solutions before looking at the solutions provided in the book. Use the solutions to check your work or to provide guidance in solving the more difficult problems. Use the incorrect solutions to help identify pitfalls and to develop strategies to avoid them.

5. Use each chapter’s solutions as a guide to understanding general problem-solving approaches. Although problems identical to those presented in *Six-Minute Solutions for Civil PE Exam Water Resources and Environmental Depth Problems* will not be encountered on the PE exam, the approach to solving problems will be the same.

For further information and tips on how to prepare for the civil PE exam’s water resources and environmental depth section, consult the *Civil Engineering Reference Manual*, the *Water Resources and Environmental Depth Reference Manual*, or PPI’s website, [ppi2pass.com/cefaq](http://ppi2pass.com/cefaq).