How to Use This Book

This book is primarily a companion to the Mechanical Engineering Reference Manual. As a tool for preparing for an engineering licensing exam, there are a few, but not very many, ways to use it. And, at least one of those ways isn’t very good.

For many editions, I envisioned this book being taken to work, on business trips, and (for the truly dedicated few) even on weekend getaways to the beach. I figured that a lighter book would “carry” a lot easier than the big Mechanical Engineering Reference Manual, so the practice problems would irresistibly call out to you every time you left the room. My vision was that you’d naturally want to bring the problems everywhere you went in order to maximize your preparation time. I never thought you’d be taking this book on a backpacking trip, but I figured you’d spend quite a few lunch breaks with the problems in your company’s break area.

Now that this book has grown to behemoth size, it’s less likely that it will leave your house. That’s okay, as long as the problems continue to call out to you. The big issue is whether you really work the practice problems or just skim over them. I never thought you’d be taking this book on a backpacking trip, but I figured you’d spend quite a few lunch breaks with the problems in your company’s break area.

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Now that this book has grown to behemoth size, it’s less likely that it will leave your house. That’s okay, as long as the problems continue to call out to you. The big issue is whether you really work the practice problems or just skim over them. Some people think they can read a problem statement, think about it for about ten seconds, read the solution, and then say “Yes, that’s what I was thinking of, and that’s what I would have done.” Sadly, these people find out too late that the human brain doesn’t learn very efficiently by observation alone. Under pressure, these people remember very little. For real learning, you have to spend some time with the stubby pencil.

There are so many ways that a problem’s solution can mess with your mind. Maybe the stumble is using your calculator, like pushing log instead of ln, or forgetting to set the angle to radians instead of degrees. Maybe it’s rusty math. What are erf(x), cosh(t), and ln e(x), anyway? How do you complete the square or factor a polynomial? Maybe it’s in finding the data needed (e.g., the specific heat of ice cream) or a unit conversion (e.g., watts to horsepower). Maybe it’s trying to determine if an equation expects L to be in feet or inches, or if the volumetric flow rate is in gallons per minute or cubic feet per second. Maybe it’s the definition of a strange term. Is the retardance coefficient the same as Manning’s roughness constant? Getting past these stumbles takes time.

And unfortunately, most people learn by doing and have to make a mistake at least once in order not to make it again. Since making a mistake while taking the exam isn’t an optimal strategy, working with the stubby pencil in your company’s break area is looking more and more attractive.

Even if you do decide to get your hands dirty and actually work the problems (as opposed to skimming through them), you’ll have to decide how much reliance you place on the published solutions. You’ll naturally probably want to maximize the number of problems you solve by spending as little time as you can on each problem. After all, optimization is the engineering way. Are you stuck on a problem? It’s tempting to turn to a solution when you get slowed down by details or stumped by the subject material. However, I want you to struggle a little bit more than that—not because I want to see you suffer, but because the “objective function” to be optimized is your exam performance. There are no prizes for minimizing your study time. When you get stuck, do your own original research as if you didn’t have a detailed solution a few pages away. Start with the Mechanical Engineering Reference Manual. You’ll be surprised what you can find in that book.

Learning something new is analogous to using a machete to cut a path through a dense jungle. By doing the work, you develop pathways that weren’t there before. It’s a lot different than just looking at the route on a map. You actually get nowhere by looking at a map. But cut that path once, and you’re in business until the jungle overgrowth closes in again.

I chose each problem for a reason. If you skip problems, your review will be piecemeal. So, do the problems. All of them—even if you think you’re not going to work in some subjects. Do them twice, once in customary U.S. units, and then, again, in SI units. Look up the references, and follow the links. Don’t look at the answers until you’ve sweated a little. And, let’s not have any whining. Please.