Midterm 3 Review

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1 Introduction

This document will provide topics to review for the midterm. It isn't possible to include all the details from the lectures and reading of course, but if you know the main topics reviewed here, you will know the main issues discussed here.

For preparing for the problem section, focus on problems that are repeated in lectures, homeworks, and quizzes (though we haven't had many quizzes since the last midterm).

2 About the midterm

2.1 In class portion

- Date: Nov 20, Thursday, 45min for in class portion (start time not specified, come for the whole lecture).
- Will cover Ch 4.9, 6 (calculations - trusses and machines, conceptual in spatial trusses),7, 8.1, 8.2, 8.3, 8.5 in Hibbeler, any lectures up through the last one (Friction part 2), examples, homeworks, quizzes, etc.
- In class: You may bring one additional sheet double sided handwritten note page (8.5x11 inches) to your previous two. It can be a totally blank printer page with no holes.
- Please bring a scientific calculator, programmable ok, but no additional info is allowed in the calculator.
- Do a lot of problems to practice! Practice being able to look at the problem and know what to do for solving it
- You will have to show your work on all short answer problems, you must use find, given, steps, and solution method on any short answer problems, but not on multiple choice problems

- There is a multiple choice section (in class part) and a short answer section (online), similar to quizzes but longer
- There are several exam versions so your neighbor won't have the same test
- Please, don't cheat on the exam, it will create problems for everybody and interfere with your learning

2.2 Take-home portion

- Date for online: Given Thursday Nov 20, Due Sat Nov 22, 11:59pm, to be completed on blackboard
- Take-home : the part at home is of course open book and open notes!
- Do a lot of problems to practice! Practice being able to look at the problem and know what to do for solving it
- You will have to show your work on all short answer problems, you must use find, given, steps, and solution method on any short answer problems, but not on multiple choice problems
- There will be several online versions, it is unlikely that two tests will be exactly the same

2.3 Description for in class part (multiple choice)

The multiple choice will be given in class this Thursday Nov 20, for part of the class. Please come for the beginning of class, and plan on staying the whole lecture. Part of the class will be a lecture, I have not specified if the test is at the beginning or end half of the class, but be ready at the beginning. The multiple choice will be worth more than the short answer, similar to previous tests (roughly 60%-40%). We will provide scantrons or something similar for you.

2.4 Description for take-home

The short answer part will be a take-home exam, to be taken on blackboard. Basically it will be similar to the quizzes, but longer and such that you don't just give the final answer, you'll have various things to fill out as you go. There will be careful instructions so please follow them. I'll also go through an example either online or in class so you see how it works. I'll give a sample problem that will be like the test which should allow you to test your system and see if it works, but use something reliable. It will be timed, the time will be defined on the test instructions, but plan to set aside 1.5 hours. For those of you who use testing accommodations please email me and we will arrange any adjustments to the

parameters of your test that are appropriate. Do not wait until the last minute to take the test and then tell me there's a problem in an email. If you do that, you risk getting zero points on the take-home portion.

3 Cheating on the take-home

3.1 Take-home portion

I've thought carefully about the issue of cheating. Let's consider the take-home portion like a super homework - **you may work together, but you must come up with your own answer, and you must understand your answer**. Also, each person will get a different set of problems, and keep in mind you will be timed. If you let somebody else come up with your answer you are not only doing something unethical, but you are also cheating yourself out of learning, and later on it will affect your ability to work as an engineer because you won't know how to do engineering. Remember the goal of this class is for you to learn about statics. In fact, I may ask you to turn in a handwritten solution to the online problems the next week on Tuesday so we can see that you understand how to be organized in solving the problem, and that you understand how you came up with your answer. Don't worry, anything you must turn in will be defined clearly in the test instructions and on Tuesday during the review sessions.

3.2 In-class portion

You are not allowed to work together on the in-class portion on Thursday.

4 Definitions and topics

This is a list of the main topics and some specific things to definitely know. This is not necessarily a complete list, but knowing this you'll have the main concepts down.

4.1 4.9 Reduction of a simple distributed loading

The idea of the magnitude of a resultant force equal to the area under the loading diagram curve. Also, how to find the location of the centroid of the distributed load (where that resultant load acts).

This section is from a while back, so there would probably not be a major calculation problem based on this alone, but you might have to do some small computations. It could also be part of a problem from a later chapter or section, so it's important to know how to do this.

4.2 Trusses

You were not asked to do any calculations with trusses last time, but needed to know about them. You may need to do some calculation involving trusses this time.

4.2.1 Method of joints

4.2.2 Method of sections

4.2.3 Space trusses

If there is anything about space trusses, it would be conceptual or a multiple choice question, not a long problem, since we haven't focused on this topic. However it was part of your homework, so there might be a simple calculation involved.

4.2.4 Frames and machines

This is important, and you should be able to do some analysis of frames and machines.

4.3 Internal forces

We spent a while on this chapter, and note it builds on 4.9 quite a bit.

4.3.1 Internal loadings developed in structural members

4.3.2 Shear and moment equations and diagrams

You should be able to generate these given a structure and loading situation.

4.3.3 Relations between distributed load, shear, and moment

We just touched on this, so understanding these relationships as well as how the interrelationships affect internal loadings is important.

4.3.4 Cables

This was covered in homework but not very much in lecture, and some of these problems can be tricky. But basically you have three situations:

- Cables subjected to concentrated loads
- Cables subjected to distributed loads
- Cables subjected to its own weight

The methods to approach these problems are quite patterned, so study examples and then homework problems.

5 Friction

5.1 Characteristics of dry friction

5.1.1 Theory of dry friction

Equilibrium, impending motion, motion. The idea that you have $F_s \leq \mu_s N$, unless you know you are just about to have motion. There is a curve associated with friction force vs. load in the various states of motion, you should know that (Fig. 8.3 in the book).

5.2 Dry friction problems

We did impending motion - will something move or not given some setup. Does the ladder slip, does the refrigerator tip or slip or is it static? Those kinds of problems should be second nature after all the practice you will do.

5.3 Wedges

5.4 Friction forces on flat belts

5.5 What isn't on the test from chapter 8

- 8.4 screws
- 8.6 friction forces on collar bearings
- 8.7 Friction forces on journal bearings
- 8.8 rolling resistance

6 Problems to review

Look for problems that crop up in multiple areas (ie lecture, homework, examples, quizzes, etc)

6.1 Lecture examples

6.2 Quiz problems

6.3 Lecture in class attention quizzes

6.4 HW problems

6.5 More suggested problems from the Mastering Engineering worked examples pdf (TBA)

7 More tips

7.1 Organization

Be as organized as possible. Lay out the problem as we have defined - given, find, steps, draw the diagram. You will get partial credit for this. Also, if you leave these things out, and get the right answer, you will only get partial credit!

7.2 Double check calculations

Don't rush your calculations. Write down the steps, simplify gradually, not all in your head. Punch in the numbers at the end.

7.3 Ask

If you are confused by a question, you may ask, we won't get angry or judge you, remember!

7.4 Use the Mastering Engineering site

If you are confused about any topic, see the mastering engineering site for video tutorials and worked examples. They are very useful and clear.

7.5 Conflicts between book and Dr. Simpkins - use Dr. Simpkins' statements for test

Just in case there is any conflict between the book or Mastering Engineering's statements and mine, please use mine to avoid confusion (for the purposes of the test). Again you can ask to clear things up.