

## Test #3 Overview

**Chapters covered:** Chapter 6 in Engineering Mechanics – Statics, 8<sup>th</sup> Edition, by Beer & Johnston

**Format:** No books, no notes, no tables provided  
Similar to class examples, homework problems, and textbook problems  
Most likely problem breakdown:

Truss analysis – Method of Joints	1 problem
Truss analysis – Method of Sections	1 problem
Frame analysis	1-2 problems
Machine analysis	1-2 problems

**Hints for success:** Work more problems for preparation.  
Include Free Body Diagrams (FBDs) in your solution.  
Show clear diagrams and all work on the test.

### Major Topics in Chapter 6

Three key structures covered: trusses, frames, and machines

#### Trusses:

- Made up of 2-force members only (so members only experience axial forces)
- Joints are pinned so yield no moments
- Designed to support a load
- Loads applied only at joints
- Axial forces in members in tension (T) or compression (C)
- Zero-force members can often be spotted by inspection
- Analyzed by two methods: Method of Joints and Method of Sections

#### Method of Joints:

- Tedious, but best method for finding forces in all members
- Generally begin by analyzing the entire structure to determine the reactions at the supports - draw FBD for the entire structure
- Continue by analyzing one joint at a time (look for joints with only 2 unknowns) - draw FBD for the joint being analyzed
- Analyze each joint with 2 equations:  $\Sigma F_x = 0$  ,  $\Sigma F_y = 0$

#### Method of Sections:

- Often the best method for finding the forces in members in the middle of a truss
- Draw a section line through the truss cutting it in half (generally cutting only 3 members in order to obtain a full solution).
- Often begin by analyzing the entire structure to determine the reactions at the supports - draw FBD for the entire structure. (Note: You actually only need to find the reactions on the part of the section that you will be analyzing.)
- Analyze either section (draw a FBD for the section to be used) using 3 equilibrium equations

#### Frames:

- Structures designed to support some load that contain at least one multiforce member
- Generally begin by analyzing the entire structure to determine the reactions at the supports - draw FBD for the entire structure
- Continue by analyzing multiforce members (draw a FBD for the multiforce member and apply the 3 equilibrium equations used for 2D objects). Look for multiforce members with 3 unknowns or less.

- If no multiforce members have 3 unknowns or less, a partial solution can sometimes be found for one multiforce member and then the results can be transferred to another multiforce member.
- When an internal force is found on one multiforce member, be sure to reverse the direction when transferring it to another multiforce member.

**Machines:**

- Structures or devices that contain at least one multiforce member
- Generally designed to modify or transmit a force
- There are often no supports with machines (Example: pliers). If supports are present, we generally begin by analyzing the entire machine to determine the reactions at the supports.
- Continue analyzing multiforce members as with frames.