2.72 Elements of Mechanical Design

Spring 2009

2.72 Pre-assessment Test
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This is an important assessment that will enable the staff to customize 2.72 lectures and activities. Your best effort on this test will help us to minimize your stress during the term, maximize what you learn, and maximize the amount of fun to be had. This is a graded activity. This must be done before Friday, February 8th, 5pm.

Some guidance on perceiving the intent and scope of the questions:

When asked about your ability/skill/knowledge, answer based upon the current state of your ability/knowledge/skill, do not use past grades or how well you did in a class.

If you need context to help answer questions, think of the design of a lathe.

Questions about "visualization" are intended to ascertain if you can see what is going on "in your head" and/or make a very simply sketch of what is going on.

Questions about "understanding how and why" are intended to ascertain if you understand the underlying physics.

Questions about "understanding how to model" are intended to ascertain if you can make appropriate assumptions, identify important parameters, draw a model picture with the right parameters, and then create an equation that solves the problem.

When asked about using "other experience(s)", we are wondering about your use of visualization, lessons learned from past work and intuition.

If a question is not applicable, mark it N/A

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Tools

01	*My ability to use a mill for making metal parts is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
02	*My ability to use a lathe for making metal parts is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
03	*My ability to use the waterjet for making metal parts is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
04	*My ability to select the right tool bits and cutting speeds is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
05	*My ability to use taps and dies to make threaded features is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
06	*The last time I setup and used a mill/lathe by myself was:*	1. Before IAP '07	2. IAP '07	3. Spring '07	4. Fall '07	5. IAP '08
07	*The amount a mini-project would improve my SolidWorks skills is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
08	*My ability to use linear algebra/matrices to solve problems is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
09	*My ability to use SolidWorks to create assemblies of parts is*	1. Low	2. Fair	3. Good	4. Very good	5. High

Mechanics

10	*My intuition about, and ability to visualize, stress-deformation is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
11	*My understanding of the physics of linear stress-strain is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
12	*My ability to model and solve linear stress-strain problems is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
13	*My understanding of the physics of plastic stress-strain is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
14	*My ability to model and solve plastic stress-strain problems is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
15	*In past hands-on projects, I have typically used this mix of equations and other skills to solve stress-strain problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
16	*In past problem sets, I have typically used this mix of equations and other skills to solve stress-strain problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
17	*My ability to tell if stress-strain answers are reasonable is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
18	*My understanding of why and how metals fatigue is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
19	*My ability to model fatigue life for metals is:*	1. Low	2. Fair	3. Good	4. Very good	5. High

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Mechanics

20	*My ability to visualize beam bending displacements/rotations is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
21	*My understanding of how and why a beam deforms is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
22	*My ability to model beam deformation under multiple loads is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
23	*In past hands-on projects, I have typically used this mix of equations and other skills to solve deformation problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
24	*In past problem sets, I have typically used this mix of equations and other skills to solve deformation problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
25	*My ability to tell if deformation answers are reasonable is:*	1. Low	2. Fair	3. Good	4. Very good	5. High

Dynamics

26	*My ability to visualize vibrations/modes shapes of parts is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
27	*My understanding of how and why parts/structures vibrate is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
28	*My ability to model machine/part vibrations is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
29	*In past hands-on projects, I have typically used this mix of equations and other skills to solve vibration problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
30	*In past problem sets, I have typically used this mix of equations and other skills to solve vibration problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
31	*My ability to tell if vibration-related answers are reasonable is:*	1. Low	2. Fair	3. Good	4. Very good	5. High

Thermo/fluid

32	*My ability to visualize thermo/fluid flow is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
33	*My understanding of how-why thermo/fluid flow occur is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
34	*My understanding of how to model thermo/fluid flow is:*	1. Low	2. Fair	3. Good	4. Very good	5. High
35	*In past hands-on projects, I have typically used this mix of equations and other skills to solve thermo/fluid flow problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
36	*In past problem sets, I have typically used this mix of equations and other skills to solve thermo/fluid flow problems:*	1. All Oth.	2. Mostly Oth.	3. Even	4. Mostly Eq.	5. All Eq.
37	*My ability to tell if thermo/fluid slow answers are reasonable is:*	1. Low	2. Fair	3. Good	4. Very good	5. High

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Design

38	*When I design, I tend to synthesize this # of initial concepts:*	○ *1. 1*	○ *2. 2-4*	○ *3. 4-6*	○ *4. 6-8*	○ *5. 8+*
39	*In past design activities, I have typically used this mix of equations and other skills to justify my design decisions:*	○ *1. All Oth.*	○ *2. Mostly Oth.*	○ *3. Even*	○ *4. Mostly Eq.*	○ *5. All Eq.*
40	*If am faced with a design problem that may be solved by Equal amounts of effort via experiment or modeling, I prefer:*	○ *1. All Mod.*	○ *2. Mostly Mod.*	○ *3. Even*	○ *4. Mostly Exp.*	○ *5. All Exp.*
41	*My ability to use non-dimensional analysis to support design decision is:*	○ *1. Low*	○ *2. Fair*	○ *3. Good*	○ *4. Very good*	○ *5. High*
42	*In past hands-on projects, I have typically used this mix of equations and other skills to solve design problems:*	○ *1. All Oth.*	○ *2. Mostly Oth.*	○ *3. Even*	○ *4. Mostly Eq.*	○ *5. All Eq.*
43	*In past problem sets, I have typically used this mix of equations and other skills to solve design problems:*	○ *1. All Oth.*	○ *2. Mostly Oth.*	○ *3. Even*	○ *4. Mostly Eq.*	○ *5. All Eq.*

Manufacturing

44	*My understanding of metal cutting physics is:*	○ *1. Low*	○ *2. Fair*	○ *3. Good*	○ *4. Very good*	○ *5. High*
45	*My understanding of common process tolerance/capabilities is:*	○ *1. Low*	○ *2. Fair*	○ *3. Good*	○ *4. Very good*	○ *5. High*
46	*My understanding of how to apply Design for Manufacturing when synthesizing concepts and creating CAD models is:*	○ *1. Low*	○ *2. Fair*	○ *3. Good*	○ *4. Very good*	○ *5. High*
47	*When I make CAD models, I include the effect of tool shapes on the geometry of the features that I create.*	○ *1. Never*	○ *2. If needed*	○ *3. Sometimes*	○ *4. Usually*	○ *5. Always*
48	*I understand how processes affect a material's microstructure:*	○ *1. Low*	○ *2. Fair*	○ *3. Good*	○ *4. Very good*	○ *5. High*
49	*In past hands-on projects, I have typically used this mix of equations and other skills to solve manufacturing problems:*	○ *1. All Oth.*	○ *2. Mostly Oth.*	○ *3. Even*	○ *4. Mostly Eq.*	○ *5. All Eq.*
50	*In past problem sets, I have typically used this mix of equations and other skills to solve manufacturing problems:*	○ *1. All Oth.*	○ *2. Mostly Oth.*	○ *3. Even*	○ *4. Mostly Eq.*	○ *5. All Eq.*