

# Introduction to Engineering Design

## Unit 1 Exam

**Instructions: Answer all of the questions by choosing the most correct answer. Write the answers on a sheet of paper and submit your answers to Mr. McGinty by the end of the week (10/17/2014)**

1. Why do you think brainstorming is helpful when solving a problem?
  - a. Because brainstorming gets a team to work together when members are all new to the design process creating a positive starting point in any group project
  - b. Because it allows for a judgment free environment where all ideas, no matter how seemingly crazy, can be suggested thus creating the most possible solutions in which to select the best one to solve the problem
  - c. Because piling on and combining ideas usually gets the best solution to any problem
  - d. Because often the problem is not well defined so through brainstorming a group can work out a problem statement which allows for the best design statement to be crafted
  
2. Why is it important not to criticize someone else's idea when you are brainstorming?
  - a. So that no person's feelings get hurt as if one is distracted by embarrassment then he/she will less likely to engage in continuing to generate ideas
  - b. So that even more ideas can be generated by silly or stupid ideas
  - c. Because it is rude to criticize someone else's ideas no matter what
  - d. Because it is important that a group work together even if an idea is a poor one and could lead to a poor solution to the problem.
  
3. Why is brainstorming best done in a group or team?
  - a. Because it is much more interesting
  - b. Because it leads to the best ideas
  - c. Because it allows for diverse approaches to a problem solution
  - d. Because it gets the group focused on one problem at a time
  
4. Explain one strategy (out of a possible 4) that a group could use to generate even more ideas after your group gets stuck when brainstorming.
  - a. If a group member argues why one idea is the best which is "choosing the best idea"
  - b. If the group determines the limitations or called "evaluation"
  - c. If the group votes on the best idea or "consensus"
  - d. If a group member were to brainstorm and idea that causes a breakthrough for many more ideas thus allowing "piling on"

5. What is the difference between a concept sketch and an artistic sketch?
  - a. A concept sketch conveys an idea using notes and visualization techniques while an artistic sketch is solely focused on esthetics
  - b. A concept sketch is solely focused on esthetics while an artistic sketch conveys an idea using notes and visualization techniques
  - c. A concept sketch is an isometric projection while an artistic sketch is a 2 point perspective
  - d. A concept sketch is a two point perspective while an artistic sketch is an isometric projection

**Read this quote from the Deep Dive Video:**

“From the buildings in which we live and work, to the cars we drive, or the knives and forks with which we eat, everything we use was designed to create some sort of marriage between form and function.” ([www.abc.com](http://www.abc.com))

6. What is Form?
  - a. Form is how an object works within a system
  - b. Form is the esthetic appearance of an object and is conveyed in three dimensions
  - c. Form is the process of creating an object of beauty
  - d. Form is the same as function
  
7. What is Function?
  - a. Function is how an object works within a system
  - b. Function is the esthetic appearance of an object and is conveyed in three dimensions
  - c. Function is the process of creating an object of beauty
  - d. Function is the same as form
  
8. How does a successful product like an I-Phone or an Android Phone have both form and function?
  - a. Smart phones like the I-Phone and Android phones have useful apps giving them form and sleek designs which incorporate function
  - b. These devices combine beauty(form) and usefulness(Function)
  - c. These devices combine esthetics (function) and dependability(form)
  - d. Smart phones like I-Phones and Android phones successfully have forming flux capacitors and functioning bridge rectifiers

9. For the design team at IDEO, once the ideas that derived from the Brainstorming session were narrowed down and divided into categories, the group was split into four smaller teams. For which phase(s) of the design process was each of these groups responsible?
- Developing 4 potential solutions
  - Determining 4 different constraints
  - Evaluating 4 different solutions
  - Designing 4 different production processes
10. What did each team do during this stage?
- Started with an idea and then redesigned it as they went along
  - Started with an idea, developed a production plan and then built a prototype of the idea
  - Started with 4 ideas and combined them in to create an interpretation of this combination
  - Started with 4 ideas and each team created those 4 ideas
11. In the video the Gossamer Condor, Paul McCreedy and his family and friends set out to win the **Kramer Prize**. What were the constraints of the **Kramer Prize**?
- Making a plane out of aluminum, wire, and Mylar powered by a bicycle
  - Making a plane that would win before the Japanese
  - Making a plane that was human powered, had control, and could fly a specified distance
  - Making a plane that could be quickly rebuilt after each crash
12. List three ways in which the McCreedy team went about gathering information in order to create a successful human powered airplane.
- Reading books on flight, computer simulation, and spying on the Japanese
  - Transferring skill in hang gliding, using models to test out ideas, and constantly attempting new adjustments to the design
  - Employing a stronger bicyclist, moving to a wind free airport, and changing the type of plastic used to cover the wing

- d. Sting upcycling system in the back yard, using computer modeling, and changing the frame design
13. What happens during the evaluation stage of the design process?
- a. A prototype is sent back for improvements
  - b. A prototype is measured against the constraints to see if it works as designed
  - c. A prototype is sent for mass production
  - d. A chosen idea from the brainstorm is designed and made
14. How were the IDEO final design, the gossamer condor, and your paper bridge evaluated?
- a. By making the ideas that the group decided upon
  - b. By sketching out or creating a model of the idea
  - c. By testing the idea against the constraints to see if it works
  - d. By mass producing the idea
15. What did all three projects have in common in their evaluation?
- a. Each evaluation included the use of tools and materials
  - b. Each evaluation came from another idea that was researched
  - c. Each evaluation included some form of measuring
  - d. Each evaluation was not capable of mass production
16. Why is it important to have some sort of design process, when you go about solving problems?
- a. There are many ways to solve most problems so you need a plan to select and implement the best way
  - b. The best way to solve problems in a group setting and that's how a design process is designed
  - c. There are many possible solutions to a problem, but you can get confused if you don't have a set of steps to follow.
  - d. All of these answers are correct
17. What is the difference between an invention and an innovation?

- a. Invention is an improved process and innovation is a new process
  - b. Invention is a new idea and innovation is an existing idea
  - c. Invention is the design and making of an improvement and innovation is the design and making of something new
  - d. Both invention and innovation include the combination of materials and know how to create something that has never been done before
18. Concept sketches are
- a. Usually two dimensional representations of a new or existing idea
  - b. Usually completed in the evaluation step of the design process
  - c. Usually never used in the Design process
  - d. Usually three dimensional representations of a new or existing idea
19. The team at IDEO are
- a. All engineers or designers
  - b. A group of “lone geniuses”
  - c. An eclectic group with diverse backgrounds beyond engineering and design
  - d. Chosen because they cooperate and work for the good of the group no matter what.
20. Which type of engineer is primarily concerned with the design and construction of structures
- a. Electrical
  - b. Chemical
  - c. mechanical
  - d. Civil
21. An environmental engineer may assist in the design of rainwater trapping systems in a desert, a wind turbine to generate electricity, and the creation of an environmentally friendly system of mosquito control. What three types of engineering would an environmental engineer need to have knowledge of?
- a. Civil, chemical, and nuclear
  - b. Chemical, electrical, and civil

- c. Chemical, mechanical, and civil
- d. Both B and C are correct