MODULE EXAM: INTRODUCTION TO ENGINEERING DESIGN - KEY

Multiple Choice

1) Which activity would an engineer do, but not a scientist?
   a. record measurements
   b. make observations
   c. draw conclusions
   d. build prototypes*

2) An engineer notices that a bicycle helmet has a flaw in its design. The chin strap separates from the helmet easily, which may cause injuries. What step should the engineer take next to improve the design of the helmet?
   a. draw block diagrams for several new helmets
   b. identify design constraints for bicycle helmets*
   c. build models of several new helmets
   d. gather information about bicycle helmets

3) Which statement describes one way that all types of engineers are similar?
   a. All engineers need to take math classes.*
   b. All engineers make the same salary.
   c. All engineers take the same classes.
   d. All engineers design new products.

4) Why can it take engineers many years to develop a product to be sold in stores?
   a. Engineers test many designs for flaws.*
   b. Engineers wait for scientists to make new discoveries.
   c. Engineers work alone to develop products.
   d. Engineers take their time to apply the scientific method.

5) Which statement about block diagrams is NOT correct?

a. Block diagrams allow engineers to see if the product actually works.*

b. Block diagrams can be used as instructions for building prototypes.

c. Block diagrams illustrate how the parts of a product fit together.

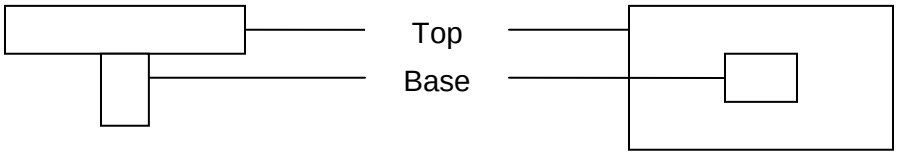
d. Block diagrams may be developed by teams of engineers.

Short Answer

6) Draw a block diagram of a desktop computer. Be sure to include and label the following parts:
   a. Monitor (screen)
   b. CPU (central processing unit)
   c. Keyboard
   d. Mouse
   e. Speakers

Diagrams will vary.

7) A student and her mother build the wooden table shown below. When the student places a heavy book on the edge of the table, it tips over. They decide to rebuild the table with the few pieces of wood and nails that are left over.



Side View

Bottom View

Use the engineering design process to answer the following questions:

a. What is one constraint the student should consider as she rebuilds the table?

   Answer: *She should consider what items she will place on the table and where they will be placed, so she can be sure that the table design will hold the weight.*

b. Describe and/or draw what you think the student's new table should look like. Explain why you think it should look like that.

   Answer: *The table should have a leg for support at each corner, or should be secured against a wall. Either of these designs would provide an even distribution of the weight of the table and of the items it supports.*

c. Describe how you could test the table to see if it is sturdy.

Answer: *You could add certain amounts of weight to the center and to one or more sides of the table, to see whether and when it tips over or leans to the side.*

8) Your teacher gives you the materials listed below. He asks you to build a car that will move a distance of 5 meters the fastest without pushing it. You will race your car against other students to see who has the best design.

   Materials

   - Rectangular pieces of wood, plastic, and metal
   - Wheels
   - Round balloons
   - Long, skinny balloons
   - Tape
   - Rubber bands
   - Paper clips

   a. Draw or describe how you would build your car. Be sure to include all of the materials you would use. If you make a drawing, label all parts of your car.

      Answer: *I would make a long, skinny body out of plastic and attach four wheels tightly with tape. I would attach a round balloon to the top of the car, at the back end, to serve as the car's "engine."*

   b. Explain why you think your car will move the fastest.

      Answer: *I think my car will move the fastest because it is long and skinny, like the fast racecars I've seen. It's also made of plastic, which is smooth like the metal body of a racecar. I also chose to power the car with a round balloon, which holds more air than the skinny balloons, and will give my car more power and speed.*