

End of Chapter Test Questions  
Answer Key

Engineering Drawing & Design  
Sixth Edition

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## Chapter 1

### *Introduction to Engineering Drawing and Design*

#### **Answers to End-of-Chapter Test Questions**

1. Rapid prototyping (RP) is the process of creating a physical and functional model from a computer-generated 3-D model.
2. Engineering drawing is the common language of engineering, and it describes the process of creating drawings for any engineering or architectural application.
3. Drafting is a graphic language using lines, symbols, and notes to describe objects for manufacture or construction.
4. Computer-aided design and drafting (CADD) is the process of using a computer with CADD software for design and drafting applications.
5. Software is the program or instructions that enable a computer to perform specific functions to accomplish a task.
6. CAD is the acronym for computer-aided design, but CAD is also a common reference to computer-aided drafting.
7. Manufactures produced parts from hand sketches or hand drawings on blackboards. American engineer and inventor Coleman Sellers, in the manufacture of fire engines, had blackboards with full-sized drawings of parts. Blacksmiths formed parts and compared them to the shapes on the blackboards. Sellers's son, George Sellers, recalls lying on his belly using his arms as a radius for curves as his father stood over him directing changes in the sketches until the drawings were satisfactory. Most designs used through the 1800s began as hand sketches of the objects to be built. Workers then converted the sketches into wooden models from which patterns were constructed. Some followed this practice well into the twentieth century. An example is Henry Ford and his famous blackboards. What is new is that the blackboards were also Ford's drafting tables. He would sketch cars and parts showing them in three dimensions and then have pattern makers construct full-sized wooden models.
8. *Interchangeability* refers to parts manufactured identically within given tolerances. Interchangeable parts are produced to specifications that will

ensure they are so nearly identical that they will fit into any product for which they are designed. One part can replace another same part, without custom fitting. Interchangeability allows easy assembly of new products and easier repair of existing products, while minimizing the time and skill required for assembly and repair.

9. There was a need to reproduce drawings easily for distribution to manufacturers or builders.
10. The term *drafter* is common when referring to a man or woman employed in the drafting profession.
11. Drafters prepare technical drawings and plans used by production and construction workers to build everything from microchips to skyscrapers. Drafters' drawings provide visual guidelines and show how to construct a product or structure. Drawings include technical details and specify dimensions, materials, and procedures. Drafters fill in technical details using drawings, rough sketches, specifications, and calculations made by engineers, surveyors, architects, or scientists.
12. Aeronautical drafters
13. Architectural drafters
14. Automotive design drafting
15. A cartographic drafter or cartographer draws maps of geographical areas to show natural and constructed features, political boundaries, and other features.
16. Casting, forging, and mold drafters create CADD models and drawings for castings, forgings, and modeled parts. Castings, forgings, and molded parts require special knowledge and attention to die and mold design, shrinkage allowances, and various other factors such as corner radii.
17. Civil drafters
18. A commercial drafter is also known as a facilities drafter.
19. Electrical drafters generate CADD models and drawings of electrical equipment, wiring diagrams, circuit-board assembly diagrams, and layout drawings used by construction crews and repairers who erect, install, and repair electrical equipment and wiring in communications centers, power

plants, industrial establishments, commercial or domestic buildings, and electrical distribution systems.

20. Electronic drafters produce CADD models and drawings such as wiring diagrams, layout drawings, mechanical detail drawings, and drawings of intermediate and final assemblies used in the manufacture, assembly, installation, and repair of electronic devices and components, printed circuit boards, and equipment.
21. Geological drafters
22. Heating, ventilating, and air-conditioning (HVAC) drafters generally work for an HVAC engineering firm developing contract documents from engineering schematics (see Figure 1.22a). HVAC drafting may involve light design work in sizing and routing systems to conform to the allotted space with the building structure; it may also require calculating heat loss and heat gain for buildings for use in determining equipment specifications.
23. An industrial process pipe drafter, also known as an *industrial pipe drafter*, *pipng drafter*, or *pipeline drafter*, prepares CADD models and drawings used in the layout, construction, and operation of oil and gas fields, refineries, chemical plants, and process piping systems.
24. Landscape drafters
25. The manufacturing industry uses mechanical drafting, with its name derived from the word *mechanisms*. The construction industry also uses mechanical drafting, but the term refers to drafting HVAC systems, which is the mechanical portion of an architectural project.
26. Mechanical drafters create CADD models and drawings of machinery and mechanical devices, indicating dimensions and tolerances, fastening and joining methods, and other engineering data and requirements. Mechanical drafters draw multiple-view part, assembly, subassembly, and layout drawings as required for the manufacture and repair of machines and equipment. Figure 1.25 shows an example of a part drawing.
27. Marine drafters
28. Patent drafters prepare clear and accurate drawings of varied sorts of mechanical devices for use by patent lawyers seeking to obtain patent rights.

29. While having coffee, the engineer sketched the idea for the new wrench on a napkin to communicate the design to the drafter.
30. This is a plumbing drafter, also known as a pipe drafter.
31. Structural drafters
32. A detail drafter, or detailer, works for a structural contractor developing 3-D models and detailed shop drawings and installation drawings, performing trade-to-trade coordination to a finished degree, and developing fabrication drawings.
33. Technical illustrators
34. Technical illustrators
35. Tool and die design drafting is a specialization of mechanical drafting. Tool and die design drafters prepare CADD models and detailed drawing plans for the manufacture of tools, usually following designs and specifications indicated by tool designers.
36. Your résumé must be a quality and professional representation of you. When an employer has many résumés, the best ones stand out.
37. Your portfolio should contain examples of school and industry drawings that you have completed. Neatly organize the drawings and select examples that help you target the specific industry discipline that you are seeking.
38. First impressions are critical. You must look your best and present yourself well. Always be on time or early. Relax as much as you can. Answer questions clearly and to the point but with enough detail to demonstrate that you know what you are talking about. It is often unwise to talk too much. Show off your portfolio. Be prepared to take a CADD test or demonstrate your skills.
39. The Internet is a valuable place to seek employment. Hundreds of Web sites are available to help you prepare for and find a job. Many Web sites allow you to apply for jobs and post your résumé for possible employers. Some employers screen applicants over the Internet. Some Web sites provide a safe place to post your résumé for only employers to review. You should always confirm that the terms of agreement provide you with a safe place to search for employment.

40. The only caution is that your personal information displayed through the Internet is available for anyone to read.
41. The American Design Drafting Association and the American Digital Design Association. The ADDA International.
42. Standards are guidelines that specify drawing requirements, appearance, and techniques, operating procedures, and record-keeping methods.
43. A standard is a set of technical definitions, guidelines, and how-to instructions for designers, manufacturers, and users.
44. International Organization for Standardization (ISO)
45. American Welding Society (AWS)
46. Ethics are rules and principles that define right and wrong conduct.
47. A code of ethics is a formal document that states an organization's values and the rules and principles that employees are expected to follow.
48. Software piracy is the unauthorized copying of software. Most software licenses support the use on one computer or computer site or by one user at any time. When you buy software, you become a licensed user. You do not own the software. You are allowed to make copies of the program for backup purposes, but it is against the law to give copies to colleagues and friends.
49. Copyright is the legal rights given to authors of original works of authorship.
50. A patent for an invention is the grant of a property right to the inventor, issued by the United States Department of Commerce, United States Patent and Trademark Office.

## Chapter 2

### *Drafting Equipment, Media, and Reproduction Methods*

#### Answers to End-of-Chapter Test Questions

1. Brainstorming is a problem-solving method that allows individuals to voice their thoughts and ideas regarding the specific topic, problem, or project at hand.
2. Manual drafting, also known as *hand drafting*.
3. Computer-aided design and drafting (CADD)
4. A scale is an instrument with a system of ordered marks at fixed intervals used as a reference standard in measurement.
5. A scale establishes a proportion used in determining the dimensional relationship of an actual object to the representation of the same object on a drawing.
6. Drawings are scaled so the objects represented can be illustrated clearly on standard sizes of paper.
7. FULL or 1:1
8. HALF or 1:2
9. The millimeter (mm) and the decimal inch (IN)
10. A general note stating UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES (or MILLIMETERS as applicable).
11. The civil engineer's scales are calibrated in multiples of ten.
12. On ten of the scales, each inch represents a specific increment of feet. Each foot is subdivided into multiples of 12 parts to represent inches and fractions of an inch. The degree of precision depends on the specific scale. The eleventh scale is the full scale with a 16 in the margin. The 16 means that each inch is divided into 16 parts, and each part is equal to 1/16 of an inch.
13. The 50 scale is for scaling dimensions that require additional accuracy, because each inch has 50 divisions. This makes each increment 1/50 in. or .02 in. ( $1 \div 50 = .02$ ).

14. Vellum is drafting paper with translucent properties that is specially designed to accept pencil or ink.
15. The ASME documents ASME Y14.1, *Decimal Inch Drawing Sheet Size and Format*, and ASME Y14.1M, *Metric Drawing Sheet Size and Format*, specify standard sheet sizes and format.
16. 11 in. vertical and 17 in. horizontal
17. 297 millimeters vertical and 420 millimeters horizontal
18. The border is the format margin of a sheet, usually between the edges of the sheet to borderlines. The borderlines form a rectangle to establish the border.
19. Zoning is a system of numbers along the top and bottom margins and letters along the left and right margins.
20. The item can be found at or near the intersection of D across and 4 up or down.
21. In the lower-right corner of sheet borderlines.
22. Identifies the sheet size designation such as A, B, A4, or A3.
23. Specifies the current revision of the part or drawing. A new or original drawing is—(dash) or 0 (zero). The first time a drawing is revised, the— or 0 changes to an A.
24. Specifies the principal drawing scale, such as FULL or 1:1, HALF or 1:2, DBL or 2:1, and QTR or 1:4. Enter NONE when there is no scale.
25. Identifies the sheet relative to a group of sheets or set of sheets. When multiple sheets are required to display a single drawing, the sheet block organizes the multiple-sheet drawing. For example, if there are two sheets needed to show a drawing, the first sheet is 1/1 or 1 OF 1 and the second sheet is 2/2 or 2 OF 2.
26. The first sheet has the complete title block and other sheet blocks, such as the angle of projection block and dimensioning and tolerance block. Additional sheets can have the same set of blocks, or they can have a continuation sheet title block. The continuation sheet title block uses a minimum of the drawing number, scale, sheet size, CAGE code, and sheet number.
27. The angle of projection block specifies how to interpret a drawing according to the method of view projection.

28. The dimensioning and tolerancing block is used to specify the general dimensioning and tolerancing specifications found on the drawing.
29. The revision history block, also called the *revision block*, is used to record changes to the drawing and is located in the upper-right corner of sheet borderlines, though some companies use other placement.
30. This compartment is only used if the drawing includes zoning, and it specifies the location of the revision.
31. A revision status of sheets block, shown in Figure 2.38, appears on the first sheet of multiple-sheet drawings and records the revision status of each drawing. This block is not required on single-sheet drawings.
32. An application block is optional and includes information such as next assembly and where used for drawings of a detail part or assembly of a component of a larger assembly.
33. Photocopy printers are also known as *engineering copiers* when used in an engineering or architectural environment. A photocopy printer is a machine for photographically reproducing material, especially by xerography.
34. Microfilm is photographic film that reproduces a drawing or other document that is highly reduced for ease in storage and sending from one place to another.
35. The optimal efficiency of design and manufacturing methods is achieved without producing a single paper copy of a drawing or a part. Computer networks can directly link the engineering and manufacturing departments through the integration of computer-aided design (CAD) and computer-aided manufacturing/machining (CAM) software. This integration is referred to as CAD/CAM. The drafter or designer creates a 3-D model or 2-D engineering drawing of a part using CADD software. CAM software is then used to convert the geometry to computer numerical control (CNC) data that is read by the numerically controlled machine tools. Often, the CAD/CAM system is electronically connected to the machine tool. This electronic connection is called *networking*. This direct link is referred to as *direct numerical control* (DNC), and it requires no additional media, such as paper, disks, CDs, or tape, to transfer information from engineering to manufacturing.