

Chapter 1: Computer Numerical Control of Machine Tools

TRUE/FALSE

1. Before the industrial revolution (1750–1830), products were largely made by hand.

ANS: T PTS: 1 REF: 3

2. Manual machine tools are obsolete.

ANS: F PTS: 1 REF: 9

3. Surface grinders and cylindrical grinders were probably the last frontier for CNC systems.

ANS: T PTS: 1 REF: 16

4. Drive motors are not a specialized component in the drive system.

ANS: F PTS: 1 REF: 24

5. The function of a feedback system is to provide the control with information about the status of the motion control system.

ANS: T PTS: 1 REF: 26

MULTIPLE CHOICE

1. A machine ____ is a machine that is capable of producing another machine.

a. motor c. round
b. producer d. tool

ANS: D PTS: 1 REF: 3

2. One horsepower is equal to lifting ____ lbs up to a distance of 1 ft in 1 second.

a. 450 c. 550
b. 500 d. 600

ANS: C PTS: 1 REF: 7

3. Today, manual machine tools have been largely replaced by ____ Control machine tools.

a. Computer Numerical c. Manual Computer
b. Computer Machine d. Manual Numerical

ANS: A PTS: 1 REF: 8

4. Lathe work has historically been ____.

a. a low-volume affair
b. a high-volume affair
c. incapable of cutting circular arcs
d. incapable of providing consistent surface finishes

ANS: B PTS: 1 REF: 14

5. A process similar to a laser is called CNC ____ cutting.
 - a. gas
 - b. plasma
 - c. liquid
 - d. solid-state

ANS: B PTS: 1 REF: 18
6. In ____, a heated head deposits minute droplets of molten plastic onto a base layer.
 - a. 3-D printing
 - b. fused deposition modeling
 - c. selective laser sintering
 - d. stereo lithography

ANS: B PTS: 1 REF: 20
7. The main control computer of a CNC system is the _____.
 - a. MCU
 - b. SLS
 - c. AGV
 - d. PLC

ANS: A PTS: 1 REF: 21
8. The simplest type of electric motor used in CNC positioning systems is the ____ motor.
 - a. resolution
 - b. drill
 - c. stepper
 - d. servo

ANS: C PTS: 1 REF: 24
9. There are two main types of feedback systems: _____.
 - a. open-loop and closed-loop
 - b. hot and cold
 - c. electronic and mechanical
 - d. digital and analog

ANS: A PTS: 1 REF: 26
10. A(n) ____ is any device that is used to give positioning feedback to the control.
 - a. machine
 - b. control unit
 - c. resolver
 - d. encoder

ANS: D PTS: 1 REF: 28

SHORT ANSWER

1. Why was the steam engine important?

ANS:

Power was now portable. A steam engine could be put on a locomotive or ship or in a factory on the Plains. The development of the steam engine was critical to the industrial revolution. The engine had to be made precisely, and that spawned one of the first modern machine tools— the Wilkinson boring mill. The boring mill was a machine that could produce a very round and straight hole for the cylinder of the engine.

PTS: 1 REF: 8

2. What are some similarities between CNC and manual machine tools?

ANS:

CNC machine tools are very similar in construction to manual machine tools. The typical CNC vertical milling machine has roughly the same components as a garden-variety conventional milling machine. Each machine has a rigid machine base to hold the moving parts, a spindle in which to mount the cutting tool, and a table that can move left to right and in and out. Attached to the table are accurate lead screws used to position the table to the proper location.

PTS: 1 REF: 9

3. What advantages do CNC lathes have over their conventional counterparts?

ANS:

CNC lathes have some unique advantages over their conventional counterparts. They can cut circular arcs that were all but impossible to cut on a conventional lathe without special tooling. CNC lathes also excel at threading. There are no gears to change or dials to watch while threading. A CNC lathe can cut virtually at any pitch and any number of leads, and it can even cut variable pitch threads without ever selecting or changing the gears. Lastly, CNC makes it easy to maintain a constant surface speed at the cutting edge as the diameter changes. This leads to an increased tool life and consistent surface finishes.

PTS: 1 REF: 14

4. What are open-architecture controls?

ANS:

In recent years, there has been a push toward so-called open architecture controls—that is, controls made from commonly available components and software. To some control builders this has meant PC-based controls. In fact, there are dozens of models of CNC controls that run on the same components that drive your desktop PC. You can go to the local computer vendor and buy parts for these controls. However, the reliability of these systems is somewhat suspect at the moment. In the future, expect great improvements and widespread adoption of the open architecture concept based on common PC hardware.

To other CNC control manufacturers, open architecture means developing and adopting an industry standard that is open to all manufacturers—not necessarily based on a Windows/PC platform. There has been some work on a standard in recent years, but no wide-scale adoption has occurred.

PTS: 1 REF: 21

5. What is the most popular language for NC programming?

ANS:

The most popular language for NC programming is G & M code programming, based on the Electronics Industries Alliance and International Standards Organization standard (EIA/ISO). This is a language standardized by American and European industry/standards organizations in an attempt to make NC programming uniform.

PTS: 1 REF: 31