

## **Chapter 1**

### **Introduction to Data Communications**

#### **True-False Questions**

The following are possible True/False questions for tests. The statement is given and the answer is provided. The level of difficulty (easy, medium, hard), the reference section relevant to the topic, and learning objective are also furnished.

1. According to John Chambers, CEO of Cisco (a leading networking technology company), the information age is the second Industrial Revolution.

**Answer:** True  
**Difficulty:** Easy  
**Reference:** Introduction  
**L.O.:** Be aware of the three fundamental questions this book answers

2. Due to advances in high speed communication networks, the information lag, or the time it takes for information to be disseminated around the world, has been significantly shortened.

**Answer:** True  
**Difficulty:** Easy  
**Reference:** Introduction  
**L.O.:** Be aware of the applications of data communications networks

3. It is not uncommon for companies to end up spending more money on network management and security tasks than they do on the actual computer equipment itself.

**Answer:** True  
**Difficulty:** Medium  
**Reference:** Introduction  
**L.O.:** Be aware of the three fundamental questions this book answers

4. Telecommunications is the transmission of voice and video as well as data and usually implies transmitting a longer distance than in a data communication network.

**Answer:** True  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

5. A local area network (LAN) connects other LANs and backbone networks (BNs) located in different areas to each other and to wide area networks in a span from 3 to 30 miles.

**Answer:** False  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

6. An intranet is a LAN that uses Internet technologies and is publicly available to people outside of the organization.

**Answer:** False  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

7. A car manufacturer may give access to certain portions of its network to some of its suppliers via the Internet. This is an example of an extranet.

**Answer:** True  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

8. The OSI model is currently the most widely implemented network model used to develop and build networks of any size, including the Internet itself.

**Answer:** False  
**Difficulty:** Medium  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

9. The network layer performs the same functions in both the OSI and Internet models and is responsible for routing messages from the source computer to the destination computer.

**Answer:** True  
**Difficulty:** Easy  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

10. In the OSI model, the application layer provides a set of utilities for applications and is the end user's access to the network.

**Answer:** True  
**Difficulty:** Medium  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

11. The application layer is the seventh layer of the Internet model and specifies the type of connection and the electrical signals that pass through it.

**Answer:** False  
**Difficulty:** Easy  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

12. At the transport layer in the Internet model, TCP is responsible for breaking large files received from the application layer into smaller messages and opening a connection to a server for transferring them.

**Answer:** True  
**Difficulty:** Hard  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

13. Ethernet is an example of a network layer protocol.

**Answer:** False  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

14. Data communication standards enable each layer in the sending computer to communicate with its corresponding layer in the receiving computer.

**Answer:** True  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

15. The specification stage of the de jure standardization process consists of developing nomenclature and identifying the problems to be addressed.

**Answer:** True  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

16. ANSI is a voting participant in the ISO.

**Answer:** True  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

## **MULTIPLE CHOICE**

The following are possible multiple-choice questions for tests. The question is posed and the answer is provided under the choices. The level of difficulty (easy, medium, hard), the reference section relevant to the topic, and learning objective are also furnished.

1. Data communications and networking can be considered as a global area of study because:
  - a. new technologies and applications emerge from a variety of countries and spread around the world
  - b. the technologies enable global communication
  - c. the political and regulatory issues are exactly the same in every country
  - d. a and b
  - e. none of the above

**Answer: D**  
**Difficulty: Easy**  
**Reference: Introduction**  
**L.O.: Be familiar with the major components of and types of networks**

2. Which of the following is **not** true about a server?
  - a. stores data and software that can be accessed by the client.
  - b. may be a personal computer or a mainframe on the network.
  - c. in client/server computing they work together over the network with client computers to support the business application.
  - d. can only perform one function on a network.
  - e. stores documents and graphics that can be accessed from any Web browser.

**Answer: D**  
**Difficulty: Hard**  
**Reference: Data Communications Networks**  
**L.O.: Be familiar with the major components of and types of networks**

3. Networks that are designed to connect similar computers that share data and software with each other are called:
- client/server networks
  - peer-to-peer networks
  - host networks
  - client networks
  - local area networks

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

4. The function of the file server is to :
- store data and software programs that can be used by client computers on the network.
  - manage all printing requests from clients on the network.
  - transfer e-mail messages to other servers on the network.
  - store HTML documents for an Internet or intranet web site.
  - coordinate the communication of client and servers on the network.

**Answer:** A  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

5. A local area network is:
- a large central network that connects other networks in a distance spanning exactly 5 miles.
  - a group of personal computers or terminals located in the same general area and connected by a common cable (communication circuit) so they can exchange information such as a set of rooms, a single building, or a set of well-connected buildings.
  - a network spanning a geographical area that usually encompasses a city or county area (3 to 30 miles).
  - a network spanning a large geographical area (up to 1000s of miles).
  - a network spanning exactly 10 miles with common carrier circuits.

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

6. A backbone network is:
- a high speed central network that connects other networks in a distance spanning up to several miles.
  - a group of personal computers or terminals located in the same general area and connected by a common cable (communication circuit) so they can exchange information.
  - a network spanning a geographical area that usually encompasses a city or county area (3 to 30 miles).
  - a network spanning a large geographical area (up to 1000s of miles).
  - a network spanning exactly 200 miles with common carrier circuits.

**Answer:** A  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

7. Which of the following is *not* a property of a WAN:
- connects backbone networks and MANS.
  - spans hundreds or thousands of miles
  - provides data transmission speeds from 56Kbps to 10Gbps.
  - connects a group of computers in a small geographic area such as room, floor, building or campus.
  - uses leased lines from IXC's like ATT, MCI, and Sprint.

**Answer:** D  
**Difficulty:** Medium  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

8. A(n) \_\_\_\_\_ is a LAN that uses the same technologies as the Internet but is open to only those inside the organization.
- WAN
  - BN
  - extranet
  - intranet
  - MAN

**Answer:** D  
**Difficulty:** Easy  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

9. A(n) \_\_\_\_\_ is a LAN that uses the same technologies as the Internet but is provided to invited users outside the organization who access it over the Internet.
- WAN
  - BN
  - extranet
  - intranet
  - MAN

**Answer:** C  
**Difficulty:** Easy  
**Reference:** Data Communications Networks  
**L.O.:** Be familiar with the major components of and types of networks

10. Which layer of the OSI model is responsible for ensuring that all packets sent are received by the destination station by dealing with end-to-end issues?
- presentation
  - transport
  - physical
  - session
  - application

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

11. Which layer of the OSI model is responsible for ensuring flow control so that the destination station does not receive more packets that it can process at any given time?
- presentation
  - transport
  - physical
  - session
  - application

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

12. The \_\_\_\_\_ layer of the OSI model is responsible for data format translation.
- a. session
  - b. presentation
  - c. physical
  - d. application
  - e. transport

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

13. The fourth layer of the OSI model is called the \_\_\_\_\_ layer.
- a. network
  - b. transport
  - c. session
  - d. data link
  - e. presentation

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

14. \_\_\_\_\_ is an orderly close to a dialogue between end users.
- a. Session termination
  - b. Physical bits
  - c. Frame overhead
  - d. Packet encapsulation
  - e. Message encryption

**Answer:** A  
**Difficulty:** Hard  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

15. In the Internet model, the application layer corresponds to the \_\_\_\_\_ layer(s) of the OSI model.
- a. data link and network
  - b. session, presentation and application
  - c. application layer
  - d. application and presentation
  - e. network, transport and presentation

**Answer:** B  
**Difficulty:** Hard  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

16. The \_\_\_\_\_ layer performs error checking which is redundant to some extent with the function of the \_\_\_\_\_ layer.
- a. application, presentation
  - b. physical, data link
  - c. transport, data link
  - d. presentation, transport
  - e. network, physical

**Answer:** C  
**Difficulty:** Medium  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

17. Which is **not** a function of the physical layer:
- a. transmission of bits.
  - b. defining the rules by which one and zeroes are transmitted.
  - c. providing error-free transmission of data.
  - d. providing the physical connection between sender and receiver.
  - e. specifying the type of connection and type of signals, waves or pulses that pass through it.

**Answer:** C  
**Difficulty:** Hard  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

18. The \_\_\_\_\_ layer is responsible for routing of messages from the sender to the final destination.
- data communication layer
  - resident layer
  - application layer
  - network layer
  - physical layer

**Answer:** D  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

19. Which of the following is **not** a function of the data link layer?
- deciding when to transmit messages over the media
  - formatting the message by indicating where messages start and end, and which part is the address
  - detecting and correcting any errors that have occurred in the transmission of the message
  - specifying the type of connection, and the electrical signals, radio waves, or light pulses that pass through it
  - controlling the physical layer by determining when to transmit

**Answer:** D  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

20. Which of the following is a function of the transport layer?
- linking the physical layer to the network layer
  - formatting messages by indicating where they start and end
  - deciding which route the message should take
  - breaking long messages into several smaller messages
  - specifying the type of connection and the electrical signals, radio waves, or light pulses that pass through it

**Answer:** D  
**Difficulty:** Easy  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

21. Which of the following is a term used to group together the physical and data link layers?
- a. Internetwork layers
  - b. Hardware layers
  - c. Software layers
  - d. Middleware layers
  - e. Application layers

**Answer:** B  
**Difficulty:** Medium  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

22. Which of the following would be a standard or protocol used at the Data Link layer of the Internet or OSI model?
- a. IP
  - b. TCP
  - c. Ethernet
  - d. HTTP
  - e. FTP

**Answer:** C  
**Difficulty:** Medium  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

23. In which layer of the Internet model would the HTTP protocol be used?
- a. physical
  - b. application
  - c. transport
  - d. network
  - e. data link

**Answer:** B  
**Difficulty:** Medium  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

24. A(n) \_\_\_\_\_ is a set of rules that determine what a layer would do and provides a clearly defined set of messages that software at the layer needs to understand.
- a. agreement
  - b. specification
  - c. protocol
  - d. regulation
  - e. policy

**Answer:** C  
**Difficulty:** Medium  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

25. The network layer of the Internet model uses the \_\_\_\_\_ protocol to route messages through the network.
- a. TCP
  - b. HTTP
  - c. FTP
  - d. SMTP
  - e. IP

**Answer:** E  
**Difficulty:** Medium  
**Reference:** Networking Models  
**L.O.:** Understand the role of network layers

26. The primary reason for networking standards is to:
- a. simplify cost accounting for networks
  - b. ensure that hardware and software produced by different vendors can work together
  - c. make it more difficult to develop hardware and software that link different networks
  - d. ensure that all network components of a particular network can be provided by only one vendor
  - e. lock customers into buying network components from one vendor

**Answer:** B  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

27. Which of the following is **not** true about de jure standards?
- They are always developed before de facto standards.
  - One example exists for network layer software (IP).
  - They can be developed by an official industry body.
  - They can take several years to develop.
  - They can be developed by a government body.

**Answer:** A  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

28. Which of the following is **not** true about de facto standards?
- They never evolve into de jure standards.
  - They are those standards that emerge in the marketplace.
  - They tend not to be developed by an official industry or government body.
  - They are generally supported by more than one vendor but de facto standards have no official standing.
  - They tend to emerge based upon the needs/response of the marketplace.

**Answer:** A  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

29. The three stages of the de jure standardization process are \_\_\_\_\_.
- specification, identification of choices and acceptance.
  - planning, implementing and acceptance.
  - brainstorming, identification and implementing.
  - specification, formalization, and acceptance.
  - none of the above.

**Answer:** A  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

30. Which of the following is true about ISO:
- a. It makes technical recommendations about data communications interfaces
  - b. Its name stands for International Organization for Standardization
  - c. It is based in Geneva, Switzerland
  - d. It is one of the most important standards-making bodies
  - e. All of the above

**Answer:** E  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

31. Which of the following is **not** true about ITU-T:
- a. It is the technical standards-setting organization of the United Nations International Telecommunications Union
  - b. It is the International Telecommunications Union – Telecommunications Group
  - c. Its membership is limited to U.S. telephone companies
  - d. It is based in Geneva, Switzerland
  - e. Its membership is comprised of representatives from over 200 member countries

**Answer:** C  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

32. The American National Standards Institute:
- a. is the coordinating organization for the United States' national system of standards
  - b. is a professional society in the U.S. whose standards committees focus on local area network standards
  - c. sets the standards that govern how much of the Internet will operate
  - d. is an agency that develops federal information processing standards for the federal government
  - e. makes technical recommendations about global telephone rates

**Answer:** A  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

33. The Internet standards organization that will allow anyone to join is

\_\_\_\_\_.

- a. ANSI
- b. ISO
- c. IETF
- d. IEEE
- e. ITU-T

**Answer:** C  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

34. Which standards body is responsible for the development of local area network (LAN) standards?

- a. ANSI
- b. ISO
- c. IETF
- d. IEEE
- e. ITU-T

**Answer:** D  
**Difficulty:** Medium  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

35. Which of the following is **not** an application layer standard?

- a. HTTP
- b. POP
- c. T1
- d. IMAP
- e. HTML

**Answer:** C  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

36. Which of the following is not a data link layer standard?
- a. HTTP
  - b. Ethernet
  - c. T1
  - d. PPP
  - e. Frame Relay

**Answer:** A  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

37. Which of the following is **not** an important future trend in communication and networking?
- a. development of online batch systems
  - b. massively online systems
  - c. the Internet of Things
  - d. Wireless LAN
  - e. BYOD

**Answer:** A  
**Difficulty:** Medium  
**Reference:** Future Trends  
**L.O.:** Be aware of three key trends in communications and networking

38. \_\_\_\_\_ ensure that hardware and software produced by different vendors work together.
- a. Delimiters
  - b. Standards
  - c. ASPs
  - d. RBOCs
  - e. Intranets

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Network Standards  
**L.O.:** Be familiar with the role of network standards

39. A \_\_\_\_\_ is the input-output hardware device at the end user's end of a communication circuit in a client-server network.
- server
  - circuit
  - client
  - host

**Answer:** C

**Difficulty:** Easy

**Reference:** Data Communications Networks

**L.O.:** Be familiar with the major components of and types of networks

40. A(n) \_\_\_\_\_ is similar to an intranet in that it uses Internet technologies, but is developed for users outside the organization.
- intranet
  - Usenet
  - Wide Area Network
  - extranet

**Answer:** D

**Difficulty:** Easy

**Reference:** Network Models

**L.O.:** Be familiar with the major components of and types of networks

41. Taken together, the physical and data link layers are called the \_\_\_\_\_.
- Internet layer
  - Hardware layer
  - Internetwork layer
  - Application layer

**Answer:** B

**Difficulty:** Easy

**Reference:** Network Models

**L.O.:** Be familiar with the major components of and types of networks

42. BYOD stands for
- Bring Your Own Device
  - Bring Your Own Database
  - Build Your Own Device
  - Build Your Own Database

**Answer:** A

**Difficulty:** Easy

**Reference:** Future Trends

**L.O.:** Be aware of three key trends in communications and networking

43. When a user accesses an application via a web browser on their mobile device, this is referred to as
- a browser-based approach
  - a native app
  - Internet Explorer
  - BYOD

**Answer:** A  
**Difficulty:** Easy  
**Reference:** Future Trends  
**L.O.:** Be aware of three key trends in communications and networking

44. A MOOC is an example of a(n)
- BYOD
  - massively online technology
  - native app
  - browser-based technology

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Future Trends  
**L.O.:** Be aware of three key trends in communications and networking

45. A network administrator has received several reports from users of the network that the intranet website on one of company servers is not accessible, but the same users are still able to retrieve their email being stored on the same server. What layer of the Internet model does this problem appear to reside at?
- physical
  - transport
  - network
  - application
  - data link

**Answer:** D  
**Difficulty:** Medium  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

46. A junior network administrator has used the wrong cable type to connect his/her computer to the administrative port on a router and cannot establish a terminal session with the device. What layer of the Internet model does this problem appear to reside at?
- physical
  - transport
  - network
  - application
  - data link

**Answer:** A

**Difficulty:** Medium  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

47. Which of the following correctly represents order of the seven layers of the OSI model from layer 1 to layer 7?
- a. physical, network, data link, session, transport, application, presentation
  - b. physical, data link, network, transport, session, application, presentation
  - c. physical, data link, network, transport, session, presentation, application
  - d. data link, physical, network, session, transport, application, presentation
  - e. data link, physical, network, transport, session, presentation, application

**Answer:** C  
**Difficulty:** Medium  
**Reference:** Network Models  
**L.O.:** Understand the role of network layers

48. When a developer creates an application for each type of device that might be used, this is referred to as
- a. a browser-based approach
  - b. a native app
  - c. Internet Explorer
  - d. BYOD

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Future Trends  
**L.O.:** Be aware of three key trends in communications and networking

49. The \_\_\_\_\_ is a connection of computers and networks built into common, everyday devices.
- a. BYOD
  - b. Internet of Things
  - c. Web of lies
  - d. Wide Area Network

**Answer:** B  
**Difficulty:** Easy  
**Reference:** Future Trends  
**L.O.:** Be aware of three key trends in communications and networking

## **SHORT ANSWER AND ESSAY**

1. How can data communications networks affect businesses?
2. From your own knowledge or background, discuss and describe three important applications of data communications networks for strategic, competitive advantage in business use. Give examples of three real world firms who have used networks for competitive advantage in the marketplace and discuss why these networks contributed to their expertise or competitive advantage.
3. How do LANs differ from WANs, and BNs?
4. Draw a diagram of the Internet model and describe what each of the five layers do. Put three examples of standards on each of your layers in the diagram. Do this in detail, explaining how a message is transmitted from one computer to another using this model.
5. How are Internet standards developed? What is a de facto standard?
6. Describe two important data communications standards-making bodies. How do they differ?
7. What is the purpose of a data and network communication standard? Give five examples of various standards and describe what that standard is (e.g., RS 232, HTTP, etc.)
8. Discuss three trends in communications and networking. Be sure to give four points for each of these trends, plus two in depth examples in your response.
9. Compare and contrast a backbone network (BN), a LAN, and a WAN. Do most organizations build WANs?
10. What are the three basic hardware components for a data communication network? Describe the functions of these.
11. Why are standards important?
12. Describe the address naming structure of computers on the Internet.
13. What is the difference between an extranet and intranet?
14. What are the seven layers of the OSI model and what does each of these layers do? How does the OSI model compare to the Internet model? What does OSI stand for, and who developed this model?
15. What is VOIP? What are some examples of companies that provide VOIP as a service to their customers?

16. Explain why it is such a great time to be an IT professional. What new skills may be needed today, that weren't required in the past?
17. Describe the advantages and disadvantages of the Internet of Things.