Chapter 2
Application Layer

True-False Questions

The following are possible True/False questions for tests. The statement is given and the answer is provided in square brackets. The level of difficulty (easy, moderate, difficult) and the page number(s) relevant to the topic are also furnished.

1. An application architecture is the way in which the functions of the application layer are performed solely by the clients in the network.

   Answer:**False**
   Difficulty: Moderate
   Reference: Application Architectures
2. The four general functions of any application program are: data storage, data access logic, application logic and presentation logic.

   Answer:**True**
   Difficulty: Easy
   Reference: Application Architectures
3. A cluster is a group of computers that are linked together so they act as a one computer.

   Answer:**True**
   Difficulty: Easy
   Reference: Technical Focus
4. A network computer is designed primarily to communicate using Internet based standards, but has no hard disk. It has only limited functionality.

   Answer:**True**
   Difficulty: Easy
   Reference: Technical Focus
5. Host-based and client-based networks are similar in that the client computer performs most of the work.

   Answer:**False**
   Difficulty: Easy
   Reference: Application Architectures
6. The earliest data communications networks were client-server networks.

   Answer: **False**
   Difficulty: Easy
   Reference: Host-Based Architectures
7. As the demand for more and more network applications grow; host-based computing becomes the best solution.

   Answer:**False**
   Difficulty: Moderate
   Reference: Host-Based Architectures

8. One major drawback to a client-server network lies in the fact that client-server networks enable software and hardware from different vendors to be used together.

Answer: False
Difficulty: Moderate
Reference: Client-Server Architectures

9. In a client-server network, the presentation logic is the responsibility of the client computer.

Answer: **True**
Difficulty: Easy
Reference: Client-Server Architectures

10. The two functions of middleware are to: 1) provide a standard way of communicating that can translate between software from different vendors, and 2) manage the message transfer between clients and servers so that clients do not need to 'know' which server contains the application's data.

Answer: **True**
Difficulty: Moderate
Reference: Client-Server Architectures

11. Middleware is the software that sits between the application software on the client and the application software on the server.

Answer: True
Difficulty: Easy
Reference: Client-Server Architectures

12. In the three-tier architecture, the software on the client computer is responsible for the presentation logic, an application server is responsible for the application logic and a separate database server is responsible for the data access logic and data storage.

Answer: True
Difficulty: Moderate
Reference: Two-Tier, Three Tier, and n-Tier Architectures

13. A "thin client" approach places most of the application logic on the client.

Answer: False
Difficulty: Easy
Reference: Thin Clients versus Thick Clients

14. The application architecture called the distributed computing model uses the "thick" client approach.

Answer: False
Difficulty: Moderate
Reference: Thin Clients versus Thick Clients

15. Scalability refers to the ability to increase or decrease the capacity of the computing infrastructure in response to changing capacity needs.

Answer: True
Difficulty: Easy
Reference: Scalability

16. To use the Web, each client computer requires a data link layer software package called a Web browser.

Answer: False
Difficulty: Easy
Reference: How the Web Works

17. The standard protocol for communication between a Web browser and a Web server is the web protocol.

Answer: False
Difficulty: Moderate
Reference: How the Web Works

18. The World Wide Web was conceived at University of Utah as part of the development of the Internet.

Answer: False
Difficulty: Easy
Reference: World Wide Web

19. A request header for an HTTP request starts with a command, such as GET, and ends with the HTTP version number that the browser understands.

Answer: False
Difficulty: Easy
Reference: Inside an HTTP Request

20. All three parts (request line, request header, request body) of an HTTP request from a web browser to a web server are required when a request is made.

Answer: False
Difficulty: Moderate
Reference: Inside an HTTP Response

21. The Simple Mail Transfer Protocol is the least commonly used e-mail standard.

Answer: False
Difficulty: Easy
Reference: How E-Mail Works

22. The two-tier e-mail architecture does not require any application software on the client computer.

Answer: False
Difficulty: Easy
Reference: Two-Tier E-mail Architecture

23. Using the POP standard for client to server e-mail communication, the e-mail messages remain on the server computer.

Answer: False
Difficulty: Easy
Reference: Two-Tier E-mail Architecture

24. Web-based e-mail like Hotmail is an example of three-tier client-server architecture that provides access to e-mail messages.

Answer: True
Difficulty: Moderate
Reference: Three-Tier Client-Server Architecture

25. The fundamental problem in client-based networks is that all data on the server must travel to the client for processing

Answer: True
Difficulty: Moderate
Reference: Client-based architectures

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, moderate, difficult) and the page number(s) relevant to the topic is also furnished.

1. A(n) _____ is the way in which the functions of the application layer software are spread among the clients and servers in the network.
   a. anonymous FTP
   b. data access logic
   c. fat client
   d. application architecture
   e. response status architecture

   Answer: D
   Difficulty: Easy
   Reference: Application Architectures

2. A _____ is a very large general-purpose computer that is capable of performing *very many* functions as if these are done simultaneously, and storing *extremely large* amounts of data.
   a. workstation
   b. transaction terminal
   c. cluster
   d. mainframe
   e. personal computer

   Answer: D
   Difficulty: Easy
   Reference: Technical Focus

3. Which of the following is **not** the type of computer commonly used as a server:

a. personal computer
b. network computer
c. handheld
d. mainframe computer

Answer: B
Difficulty: Easy
Reference: Technical Focus

4. A _____ is a group of computers linked together so that they act as one computer.

a. workstation
b. transaction terminal
c. cluster
d. network computer
e. transaction terminal

Answer: C
Difficulty: Easy
Reference: Technical Focus

5. A _____ is the type of computer you use in your home and is the most common type of client today.

a. personal computer
b. mainframe
c. handheld
d. cluster
e. transaction terminal

Answer: A
Difficulty: Easy
Reference: Technical Focus

6. A _____ is a group of computers linked together so that they act as one computer.

a. handheld
b. mainframe
c. network computer
d. cluster
e. transaction terminal

Answer: D
Difficulty: Easy
Reference: Technical Focus

7. Which of the following is not **true** a dumb terminal:

a. it has a monitor, keyboard and no CPU
b. all the processing takes place on the host computer.
c. it does not participate in the processing of the data it displays
d. you can install your latest application software on it.
e. it is basically an input/output device.

Answer: D
Difficulty: Moderate
Reference: Technical Focus

8. Which of the following is **not** a general function by any application program?
    a. data storage
    b. data access logic
    c. application logic
    d. presentation logic
    e. application access storage

Answer: E
Difficulty: Moderate
Reference: Application Architectures

9. _____ is an application program function that deals with storing and retrieving data.
    a. data storage
    b. data access logic
    c. application logic
    d. presentation logic
    e. application access storage

Answer: A
Difficulty: Easy
Reference: Application Architectures

10. An application program function is _____, or the processing required to access data.
    a. data storage
    b. data access logic
    c. application logic
    d. presentation logic
    e. application access storage

Answer: B
Difficulty: Easy
Reference: Application Architectures

11. _____, or the algorithms or business logic programmed into the application, can be simple or complex depending on the application.
    a. data storage
    b. data access logic
    c. application logic
    d. presentation logic
    e. application access storage

Answer: C
Difficulty: Easy
Reference: Application Architectures

12. _____ is the presentation of information to the user and the acceptance of the user's commands.
    a. data storage
    b. data access logic
    c. application logic
    d. presentation logic
    e. application access storage

Answer: D
Difficulty: Easy
Reference: Application Architectures

13. One underlying problem with a host-based network is that:
    a. there are economies of scale because all computer resources are centralized
    b. the server can get overloaded since it must process all messages
    c. the architecture is relatively simple and works well
    d. the server is the one point of control which simplifies security
    e. clients (terminals) do not require sophisticated hardware/software because they do not perform most of the work in this type of architecture

Answer: B
Difficulty: Moderate
Reference: Host-Based Architectures

14. With a client-based network, one fundamental problem is that:
    a. the clients each must store all the data
    b. the server does not have any data storage capability
    c. the host or server must perform presentation logic, application logic, and data access logic at the same time
    d. all data on the server must travel to the client for processing
    e. the clients must perform the data storage logic

Answer: D
Difficulty: Easy
Reference: Client-Based Architectures

15. With the two-tier client-server architecture, the client is responsible for the _____ logic and the server is responsible for the _____ logic.

    a. Application; presentation
    b. Presentation; data access
    c. Data access; presentation
    d. Application; data access
    e. Presentation; application storage

Answer: B
Difficulty: Moderate
Reference: Two-Tier, Three-Tier, and n-Tier Architectures

16. Client-server architectures:
    a. cannot connect computers that use different hardware
    b. are one of the least used network architectures today
    c. can use middleware to provide a standard way of communicating between software from more than one vendor
    d. assign the responsibility for the presentation logic to the server
    e. were the earliest type of network architectures

Answer: C
Difficulty: Moderate
Reference: Client-Server Architectures

17. How are the application architecture functions split up in a client-server network?
    a. the presentation logic and data storage are on the client, while the data access logic is on the server
    b. the data storage, data access, and presentation logic are on the client
    c. the presentation logic is on the client, while the data storage and data access logic are on the server
    d. the data storage and data access logic are on the client, while the presentation logic are on the server
    e. the presentation logic and data access logic are on the client, and the data storage is on the server

Answer: C
Difficulty: Moderate
Reference: Client-Server Architectures

18. In a client-server network, _____ gets software from different vendors to work together.
    a. a front-end processor
    b. serverware
    c. middleware
    d. centerware
    e. programmer

Answer: C
Difficulty: Easy
Reference: Client-Server Architectures

19. _____ is **not** an important middleware standard.
    a. CORBA (Common Object Request Broker Architecture
    b. Distributed Computed Environment (DCE)
    c. Asynchronous Transfer Mode (ATM)
    d. Open Database Connectivity (ODBC)
    e. none of the above is an appropriate answer

Answer: C
Difficulty: Moderate
Reference: Client-Server Architectures

20. A(n) _____-tiered architecture uses only two sets of computers: one set of clients and one set of servers.
    a. one
    b. two
    c. three
    d. five
    e. n

Answer: B
Difficulty: Easy
Reference: Two-Tier, Three-Tier, and n-Tier Architectures

21. In the three tier architecture the software on the client computer is responsible for_____.

    a. presentation logic
    b. application logic
    c. data access logic
    d. data storage
    e. application storage

Answer: A
Difficulty: Easy
Reference: Two-Tier, Three-Tier, and n-Tier Architectures

22. An N-tiered architecture:
    a. is generally more "scalable" than a three-tiered architecture
    b. is generally less "scalable" than a three-tiered architecture
    c. uses only two sets of computers in which the clients are responsible for the application and presentation logic, and the servers are responsible for the data
    d. uses exactly three sets of computers in which the client is responsible for presentation, one set of servers is responsible for data access logic and data storage, and application logic is spread across two or more different sets of servers
    e. puts less load on a network than a two-tiered architecture because there tends to be less communication among the servers

Answer: A
Difficulty: Easy
Reference: Two-Tier, Three-Tier, and n-Tier Architectures

23. One disadvantage of the _____ architecture is that places a greater load on the network.

    a. two-tier
    b. three tier
    c. one-tier
    d. n-tier
    e. layered

Answer: D
Difficulty: Easy
Reference: Two-Tier, Three-Tier, and n-Tier Architectures

24. A “thin client” architecture approach:
    a. always is a two-tier network architecture
    b. always is an n-tiered architecture
    c. places all or almost all of the application logic on the client
    d. places all or almost all of the application logic on the server
    e. refers to the size of the cable connecting the clients to the network

Answer: D
Difficulty: Easy
Reference: Thin Clients versus Thick Clients

25. A “thick client” architecture approach:
    a. always is a two-tier network architecture
    b. always is an n-tiered architecture
    c. places all or almost all of the application logic on the client
    d. places all or almost all of the application logic on the server
    e. refers to the size of the cable connecting the clients to the network

Answer: C
Difficulty: Easy
Reference: Thin Clients versus Thick Clients

26. With the “thin client” architecture, when an application changes, only the _____ with the application logic needs to be updated.
    a. client
    b. server
    c. middleware
    d. hardware
    e. software

Answer: B
Difficulty: Moderate
Reference: Thin Clients versus Thick Clients

27. With respect to costs for a client-server network, which of the following is true?
    a. Personal computers used as clients in a client-server network cost about the same as mainframes for the same amount of computing power.
    b. More network capacity, which costs more money, is required for client-server networks than for client-based networks.
    c. Experts believe that client server architectures can be complex, but that developing application software for host based architectures is usually cheaper.
    d. Updating the network with new version of software tends to be less expensive in a client-server network since the software is centralized in one client.
    e. None of the above

Answer: C
Difficulty: Moderate
Reference: Cost of Development

28. The idea for a special hypertext network, called the World Wide Web, was conceived of by:
    a. Microsoft in 1994 as part of the Windows 95 project
    b. Tim Berners-Lee at the European Laboratory for Particle Physics (CERN) in 1989
    c. Vinton Cerf, for the U.S. Department of Defense in 1969 as a network of four computers called ARPANET
    d. Howard Flieshman of IBM in 1982 as part of the development of the IBM PC
    e. the University of Minnesota as an extension of Gopher

    Answer: B
    Difficulty: Easy
    Reference: World Wide Web

29. Marc Andreessen led a team that developed the first graphical Web browser, which was called:
    a. Internet Explorer
    b. Mosaic
    c. Firebird
    d. Netscape Navigator
    e. Mozilla

    Answer: B
    Difficulty: Easy
    Reference: World Wide Web

30. To interact with the World Wide Web, a client computer needs an application layer software package called a:
    a. Web browser
    b. Web server
    c. Telnet package
    d. Uniform Resource Locator package
    e. Router package

    Answer: A
    Difficulty: Easy
    Reference: How the Web Works

31. Each server on a network that needs to act as a web server needs an application layer software package called a (n) _____.

    a. browser
    b. application web
    c. web server
    d. operating system
    e. none of the above

    Answer: C
    Difficulty: Easy
    Reference: How the Web Works

32. To get a page from the Web, a user must type in a URL, which stands for:
    a. Unknown Resource Locator
    b. Unknown Router Location
    c. Uniform Router Location
    d. Uniform Resource Locator
    e. Uniform Resource Library

Answer: D
Difficulty: Easy
Reference: How the Web Works

33. The protocol that makes it possible for a Macintosh web browser to be able to retrieve a Web page from a Microsoft Web server is called _____.

    a. Hypertext Transfer Protocol
    b. File Transfer Protocol
    c. Simple Mail Transfer Protocol
    d. Internet Message Access Protocol
    e. Hyperlink Transfer Protocol.

Answer: A
Difficulty: Moderate
Reference: How the Web Works

34. There are optional and required parts of an HTTP request. They are:
    a. request address, request body
    b. request address, request header, request body
    c. request line, request header
    d. request line, request body
    e. request line, request header, request body

Answer: E
Difficulty: Moderate
Reference: Inside an HTTP Request

35. There are required and optional parts of an HTTP response. They are:
    a. response status, response header, response body
    b. response address, response header, response body
    c. response status, response body
    d. response address, response header
    e. response status, response header

Answer: A
Difficulty: Moderate
Reference: Inside an HTTP Response

36. A response status code of 404 means:

a. the requested page was not found
b. the server is currently unavailable
c. the sever is currently busy
d. your browser is incompatible with the Web server software.
e. your browser needs to be updated to the latest version.

Answer: A
Difficulty: Easy
Reference: Inside an HTTP Response

37. The acronym, HTML, refers to:

a. Header Markup Language
b. Hypertext Markup Locator
c. Hypertext Markup Language
d. Hypertext Markup Library
e. Hypertext Modulating Language

Answer: C
Difficulty: Easy
Reference: Inside an HTTP Response

38. Which of the following is **not** an advantage of instant messaging?

a. It usually takes days for an IM message to be delivered to the recipient.
b. It allows real time typed messages to be exchanged.
c. Some products are ICQ and AOL Instant Messenger.
d. It is generally faster than snail-mail.
e. It helps people avoid telephone tag.

Answer: A
Difficulty: Easy
Reference: Instant Messaging

39. The most commonly used e-mail standard is:

a. Simple Mail Transfer Protocol
b. X.400
c. CMC
d. Post Office Protocol
e. Telnet

Answer: A
Difficulty: Easy
Reference: How E-mail Works

40. In a two-tier client-server architecture, a client computer needs to use an application layer software package called a _____ to send e-mail:

a. message transfer agent
b. router agent
c. user agent
d. Webcast package
e. gateway agent

Answer: C
Difficulty: Moderate
Reference: Two-tier E-mail Architecture

41. Which of the following is **not** a user agent package?

a. Outlook Express
b. Microsoft Word
c. Fedora
d. Netscape Messenger
e. Microsoft Outlook

Answer: B
Difficulty: Moderate
Reference: Two-tier E-mail Architecture

42. Another term for a user agent is:
a. message transfer agent
b. router agent
c. e-mail client
d. Webcast package
e. Web client

Answer: C
Difficulty: Easy
Reference: Two-tier E-mail Architecture

43. IMAP (Internet Message Access Protocol):
a. is a set of standards that define how email is to be processed between mail servers
b. is exactly the same as SMTP
c. copies an e-mail message from the client computer's hard disk, deletes it from the client, and stores it on the mail server
d. is exactly the same as POP
e. permits an e-mail message to remain stored on the mail server even after they have been read by a client computer

Answer: E
Difficulty: Easy
Reference: Two-tier E-mail Architecture

44. In a _____ architecture, computers are both client and server, thus sharing the work.
a. Host-based
b. Client-based
c. Client-server
d. Peer-to-peer
e. Network

Answer: D
Difficulty: Moderate
Reference: Application Architectures

45. With a _____, one computer acts as several servers.
a. Mainframe
b. Virtual server
c. Terminal
d. Network computer
e. Transaction terminal

Answer: B
Difficulty: Moderate
Reference: Technical Focus 2.1

46. The acronym, MIME, refers to:
    a. Multimedia Internet Mail Enterprise
    b. Multiple Internet Media Extension
    c. Multipurpose Internet Mail Extension
    d. Media Internet Mail Extension
    e. Multimedia Internet Mime Extension

Answer: C
Difficulty: Easy
Reference: Attachments in Multipurpose Internet Mail Extensions

47. One of the most frequently used Telnet applications is
    a. WS-FTP
    b. PuTTY
    c. Outlook
    d. Word

Answer: B
Difficulty: Moderate
Reference: Telnet

48. The fastest growing form of videoconferencing is
    a. mainframe
    b. Outlook
    c. Telnet
    d. webcasting
    e. desktop

Answer: E
Difficulty: Moderate
Reference: Videoconferencing

49. Which of the following is **not** true about Telnet?
    a. Telnet requires an application layer program on the client computer and an application layer program on the server or host computer.
    b. Telnet poses no security threat.
    c. Telnet was designed in the early days of the Internet.
    d. You are using a host-based architecture with Telnet.
    e. One program that conforms to the Telnet standard is EWAN.

Answer: B
Difficulty: Moderate
Reference: Telnet

50. _____ is a special type of one directional; videoconferencing in which content is sent from the server to the user.

    a. broadcasting
    b. instant messaging
    c. webcasting
    d. H.323
    e. Net Meeting.

Answer: C
Difficulty: Moderate
Reference: Video Conferencing

51. In a host-based system with a mainframe, upgrades to the host are _____.
    a. Small
    b. Cheap
    c. Lumpy
    d. Never going to happen
    e. Always performed annually

    Answer: C
    Difficulty: Easy
    Reference: Host-based architectures
52. The software that runs on the mail server is referred to as the _____
    a. Mail transfer agent
    b. Mail user agent
    c. Microsoft Outlook
    d. Web server
    e. SMTP

    Answer: A
    Difficulty: Easy
    Reference: How e-mail works
53. The standards H.320, H.323, and MPEG-2 are commonly used with
    a. Telnet
    b. Videoconferencing
    c. Email
    d. IM
    e. Microsoft Office

    Answer: B
    Difficulty: Moderate
    Reference: Videoconferencing

Essay and Short Answer Questions

1. Describe the history of the Internet and the Web (part of this is in Chapter 1, part in Chapter 2). Where do you forsee the future evolution of the Internet heading, and why?

2. What do the following tools enable you to do: the Web, email, Telnet, IM?

3. How can the Internet be used for competitive advantage in business? Describe three firms which are using the Internet for conducting business, and speculate as to the underlying technologies which might be in use in these firms. Will the Internet become an essential business tool like the telephone or will it go the way of the dinosaurs? What do you envision the Internet and web becoming in the future for businesses? Discuss.

4. For what is HTTP used? What are its major parts? Are all required?

5. For what is HTML used? What are its major parts? Are all required?

6. Describe how a Web browser and Web server work together to send a web page to a user. Draw a diagram and label the parts to assist you in your description.

7. Describe how mail user agents and message transfer agents work together to transfer mail messages, including a diagram.

8. Describe the difference between a two tier and three tier email message transfer, using diagrams and discussing how this approach differs from the two layer email transfer. Do users always require the same architecture for email? Why or why not? Discuss.

9. What is MIME? What does it stand for? Why was it developed?

10. What are the standards SMTP, POP, and IMAP? What roles do SMTP, POP, and IMAP play in sending and receiving email on the Internet? What do these acronyms stand for?

11. What are the major parts of an email message?

12. What is X.400 and CMC?

13. What is cloud computing and how is it useful?

14. What is Telnet and why is it useful?

15. What is IM? How does it work? Draw a schematic of it.

17. Discuss the functions of a web browser. Describe two web browsers. What was the first graphical Web browser? What are three search engines that you might use to find information on the Internet?

18. What are the three major parts of an HTTP request and what information does each part contain? Why does HTTP include a version number as part of the packet?

19. What do a user agent and message transfer agent do in an SMTP/IMAP email system? What are some examples of user agent packages?

20. Describe and sketch a two tier, three tier and n-tier architecture. What is a network architecture? Compare and contrast two-tiered, three-tiered, and n-tiered client server architectures. What are the technical differences and what advantages and disadvantages do each offer? How does a 2-tier client server network differ from an n-tier client server network. Describe one advantage and one disadvantage that a 3-tier architecture has compared to a 2-tier architecture.

21. What are the advantages and disadvantages of host-based networks versus client-server networks? Explain two major benefits and/or limitations of client-server networks compared to host-based networks.

22. What is middleware and what does it do?

23. Suppose your organization was contemplating switching from a host-based architecture to client-server. What problems would you foresee?