College of Computer Sciences and Engineering

Information and Computer Science Department

ICS 343: Fundamentals of Computer Networks (3-3-4)

Quiz#1 Key

Name: **ID:**

Part I (Chapter 1)

1.1. Why are protocols needed?

A protocol is synonymous with a rule. A communication protocol is a system of rules for data exchange between computers
A protocol defines what is communicated, how it is communicated and when it is communicated
- **Syntax: it refers to the structure or format of data.**
- **Semantics: it refers to the meaning of each section of bits**
- **Timing: It refers to two characteristics; when and how much to send**
Example: The Internet Protocol (IP)

1.2. Name the four basic network topologies, and cite an advantage of each type.

1- Mesh Topology: Guaranteed load, robust, privacy or security, fault identification and fault isolation is easier.
2- Star Topology: Less expensive, one link and one I/O port, easy to install and reconfigure, less cabling (but more than bus or ring), node failure will not affect others, fault identification is easier.
3- Bus Topology: Easy to install, less cabling.
4- Ring Topology: Easy to install, fault isolation is easier, Signal circulates at all times (alarm alerts the problem and its location).

1.3. What is an internet? What is the Internet?

An internetwork (or *internet*) is a switched network in which a switch connects at least two links together.

The *Internet* is the most notable internet. It consists of many connected networks using TCP/IP protocols.

1.4. What is the difference between half-duplex and full-duplex transmission modes?

In half-duplex, each station (node) can both send and receive, but not at the same time (e.g. Walky-talky).
In full-duplex, both stations can send and receive simultaneously.

1.5. Explain the difference between packet-switching and circuit-switching.

In Circuit-switching, a dedicated connection (circuit) is always available between any two end nodes. This may cause reduced efficiency due to wasted capacity during idle periods.

In packet-switching, the communication medium is shared and never reserved for two ends. Routers (switches) with queues are deployed here to store-forward packets as bandwidth is available. Packet-switching enjoys hhigher efficiency due to maximum utilization of capacity.

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Part II (Chapter 2)

2.1. What are the types of addresses (identifiers) used in each of the following layers?
a) application layer b) network layer c) data-link layer

- **Application layer: Names (such as web addresses: kfupm.edu.sa or email addresses: alfagih@kfupm.edu.sa)**
- **Network layer: Logical addresses.**
- **Data-link layer: Link-layer (MAC) addresses.**

2.2. Explain why multiplexing/demultiplexing do not take place at the application layer.

Answer #1 (From lecture slides):
Multiplexing means that a protocol at a layer can encapsulate a packet from several <u>next-higher</u> layer protocols (one at a time).
Demultiplexing means that a protocol can decapsulate and deliver a packet to several <u>next-higher</u> layer protocols (one at a time).
Note: There is NO layer higher than the Application layer in the TCP/IP model.

Answer #2: (From pages 43, 44):
To be able to multiplex and demultiplex, a protocol needs to have a field in its header to identify to which protocol the encapsulated packets belong. At the transport layer, several protocols can accept a message from several Application layer protocols.

2.3. A host communicates with another host using the TCP/IP protocol
      suite. What is the unit of data sent or received at each of the
      following layers?
      a) application layer b) network layer c) data-link layer

   • **Application layer: Message.**
   • **Network layer: Datagram.**
   • **Data-link layer: Frame.**
See Figure (2.9).

2.4. Which layers of the TCP/IP protocol suite are involved in a link-
      layer switch?

Data-link layer and Physical layer (Figure 2.5).

2.5. If there is a single path between the source host and the
      destination host, do we need a router between the two hosts?

**Yes if the two nodes are on two different LANs, then a router is still
required to determine the only available path by applying the IP
(Internet Protocol).**

Part III (Chapter 25)

3.1. In the client-server paradigm, explain why a server should be run
      all the time, but a client can be run when it is needed.

**Client application programs run on a local machine and request a
service from another application program – server – running on a
remote machine.**
**Generally, a client application program that requests a service should
run only when it is needed. A server program providing service should
run all the time, as it does not know when or how frequent its
services will be needed.**

3.2. Why are Application Programming Interfaces (APIs) needed?

**If we need a process to be able to communicate with another process,
we need a new set of instructions to tell the lowest four layers of
the TCP/IP suite to open the connection, send and receive data from
the other end, and close the connection.**
**A set of instructions of this kind is normally referred to as an
Application Programming Interface (API).**

3.3. Explain what an Interface Socket is.

**A Socket is a software construct that supports network input/output.
An application creates a socket when it needs a connection to a
network. It then establishes a connection to a remote application via
the socket.**
**Communication is achieved by reading data from the socket and writing
data to it.**

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3.4. Explain the two types of socket addresses from the server's side.

Local & Remote Socket Addresses are explained on pages 825 and 826.

3.5. Name three known application layer protocols (You may use acronyms).
- **FTP**
- **SSH**
- **HTTP**
- **HTTPS**
- **DNS**
- **SMTP**
- **SNMP**

Part IV (Chapter 26)

4.1. Briefly explain the similarities and differences Between FTP and HTTP.

HTTP and FTP are both Application layer protocols used for exchanging (upload/download) data.
FTP appeared before HTTP.
HTTP is used mainly to access data on the WWW

HTTP is generally faster than FTP.
FTP uses two connections. It uses a first primary connection to send control commands, and when it sends or receives data, it opens a second TCP stream for that purpose.
HTTP transfers are primarily just one request and one response (for each document).
FTP has a notion of file format so it can transfer data as ASCII or binary, whereas HTTP always sends data in binary.

4.2. In DNS, which of the following are FQDNs and which are PQDNs?
a) xxx b)xxx.yyy.net c)xxx.yyy.zzz.edu.

(a) and (b) are PQDNs. (c) is a FQDN.

4.3. In a non-persistent HTTP connection, how can HTTP inform the TCP protocol that the end of the message has been reached?

Client reads data until EOF (end-of-file) character is reached, then it closes connection. (See page 876).

4.4. Briefly explain the differences between static, dynamic and
      active documents according to HTML.

The difference is explained on page 875 of the textbook.

4.5. Based on the figure bellow, explain why POP/IMAP protocols are
      applied instead of SMTP.
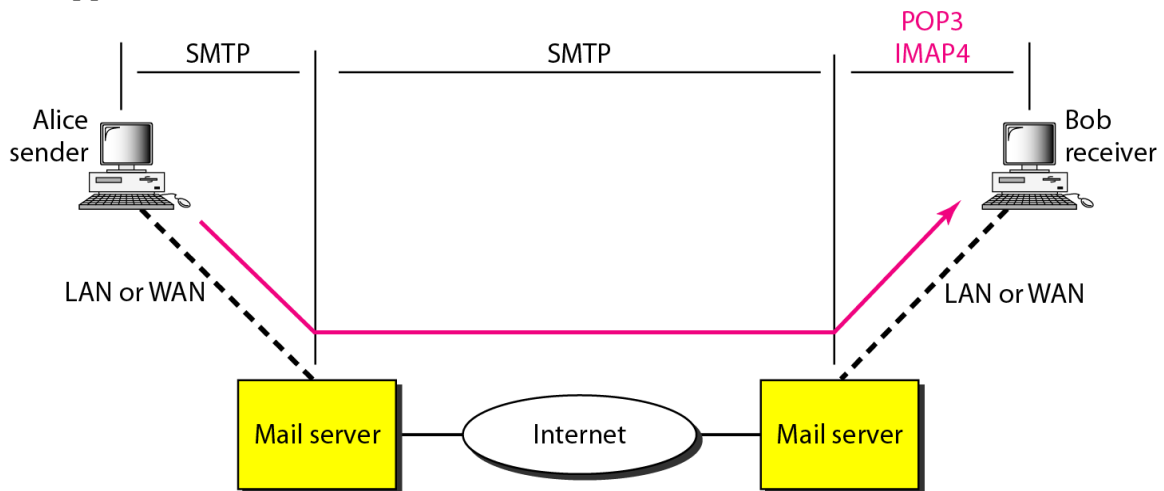
**The first and the second stages of mail delivery use SMTP. However,
SMTP is not involved in the third stage because SMTP is a *push*
protocol; it pushes the message from the client to the server. In
other words, the direction of the bulk data (messages) is from the
client to the server. On the other hand, the third stage needs a pull
protocol; the client must pull messages from the server. The direction
of the bulk data are from the server to the client. The third stage
uses a message access agent. POP and IMAP are examples of pulling
protocols.**