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Internal Assessment Test 1 – September 2017

Sub:	Computer Networks							Code:	16MCA 31
Date:	18/9/2017	Duration:	90 mins	Max Marks:	50	Sem:	3	Branch:	MCA

Answer Key

1. Draw the OSI network architecture. Explain each layer in detail.(10 Marks).

The OSI model has seven layers. The principles that were applied to arrive at the seven layers can be briefly summarized as follows:

1. A layer should be created where a different abstraction is needed.
2. Each layer should perform a well-defined function.
3. The function of each layer should be chosen with an eye towards defining internationally standardized protocols.

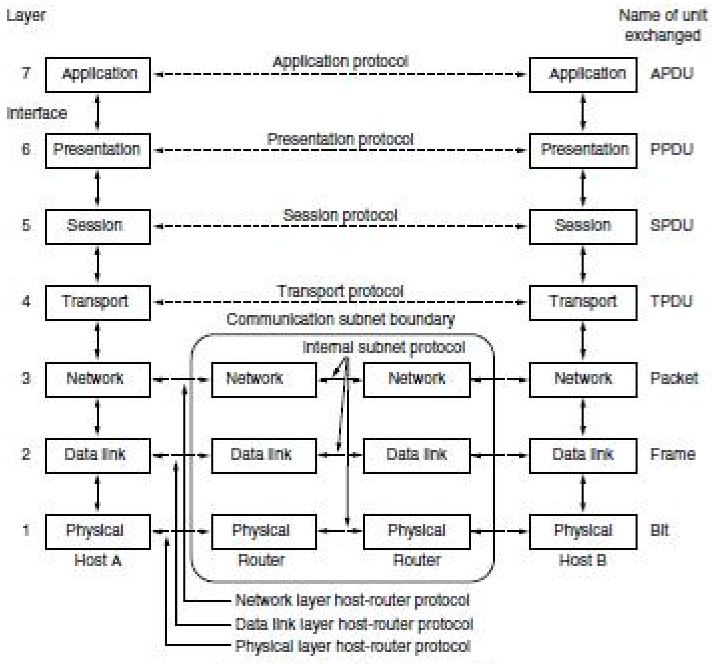


Figure 1-20. The OSI reference model.

4. The layer boundaries should be chosen to minimize the information flow across the interfaces.
5. The number of layers should be large enough that distinct functions need not be thrown together in the same layer out of necessity and small enough that the architecture does not become unwieldy

Application Layer:

1. Using this layer the user interacts with application to provide data.
2. It acts like an interface to application program.
3. Http and ftp protocols will be used in this layer.

Presentation Layer:

1. It describes the syntax and semantics of the information to be transmitted.
2. Data structure to be used will be defined in an abstract way along with encoding with different representation to be communicated.
3. It compresses the data to be communicated .
4. It converts system specific data to network specific.

Session Layer:

1. It creates, establishes and manages sessions between them.
2. It provides services like dialog control, token management, synchronization.

Transport Layer:

1. It provides end-to-end connection of transporting messages.
2. It provides error control and flow control.
3. It specifies how much information should be sent and when to send.

Network Layer:

1. It specifies how packets are routed from source to destination.
2. Routing can be based on static tables that are wired into the network.
3. It handles congestion.
4. It specifies the quality of service like jitter, delay etc

Data Link Layer:

1. It provides transmission of error free data in the form of frames.
2. Switches will be operated in this layer.
3. It provides synchronization, error and flow control.
4. It is responsible for providing acknowledgement frame.

Physical Layer:

1. It is responsible for transmitting raw bits over a channel.
2. It specifies whether transmission may proceed simultaneously in both directions.
3. It specifies how to represent 0 or 1.
4. It specifies mechanical, electrical interfaces as well as physical transmission medium.

2. a. Explain DNS. (5 Marks)

DNS uses transport services to build distributed applications. For the Internet, the top of the naming hierarchy is managed by an organization called **ICANN** (**Internet Corporation for Assigned Names and Numbers**).
The Internet is divided into over 250 **top-level domains**, where each domain covers many hosts. Each domain is partitioned into sub domains, and these are further partitioned, and so on. The leaves of the tree represent domains that have no subdomains (but do contain machines, of course). A leaf domain may contain a single host, or it may represent a company and contain thousands of hosts.

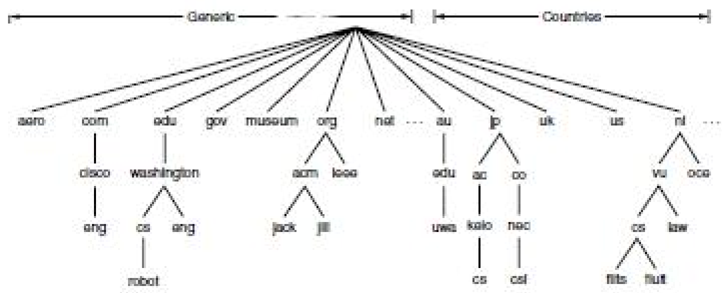


Figure 7-1. A portion of the Internet domain name space.

The top-level domains are run by **registrars** appointed by ICANN. Getting a name merely requires going to a corresponding registrar (for *com* in this case) to check if the desired name is available and not somebody else's trademark. If there are no problems, the requester pays the registrar a small annual fee and gets the name.

Every domain, whether it is a single host or a top-level domain, can have a set of **resource records** associated with it. These records are the DNS database. For a single host, the most common resource record is just its IP address, but many other kinds of resource records also exist. When a resolver gives a domain name to DNS, what it gets back are the resource records associated with that name. Thus, the primary function of DNS is to map domain names onto resource records.

A resource record is a five-tuple. Although they are encoded in binary for efficiency, in most expositions resource records are presented as ASCII text, one line per resource record. The format we will use is as follows:

Domain name Time to live Class Type Value

b) Differentiate between FDMA and TDMA. (5 Marks)

FDMA	TDMA
Finite portion of the bandwidth is available for the permanent use to the user.	Entire bandwidth is available but only for the finite time
When channel is not in use, the bandwidth of that channel is wasted.	Bandwidth is allocated for the finite time to the user, after completion of work of the first user second user can use re-use it.
Not require synchronization or timing control	requires careful time synchronization
No synchronization so it becomes algorithmically simple	complex
Requires guard bands	Not necessarily required
Large guard time between the channels	small
Large guard bands wastes large bandwidth	small guard bands so wastage of channel bandwidth is very small
Transmitter and receiver operate at the same time	not necessary because it uses different time slots for transmission and reception.
In wireless communication, this achieves simultaneous transmission and reception by using Frequency Division Duplexing	In this duplexing is Time Division Duplexing

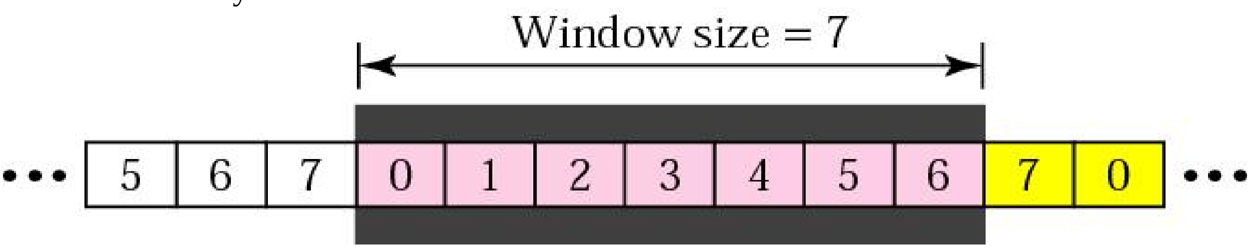
3.a. Write the differences between LAN, MAN and WAN. (5 Marks)

Differences between LAN, MAN, WAN

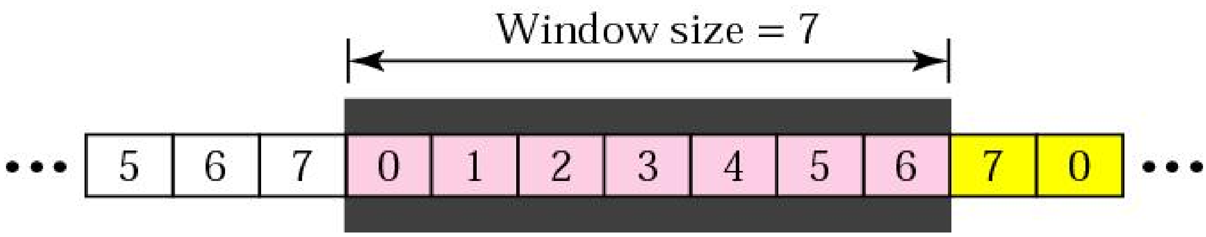
BASIS	LAN	MAN	WAN
Range	A communication network linking a number of stations in same local area. Range is 1 to 10 km	This network shares the characteristics of packet broadcasting networks. Range is 100 km	A communication network distinguished from a Local Area Network. Range is Beyond 100 km
Media Used	Uses guided media	Uses guided as well as unguided media	Uses unguided media
Speed	A high speed i.e. 100kbps to 100mbps	Optimized for a large geographical area than LAN.	Long distance communications, which may or may not be provided by public packet network.
Cost	cheaper	costly	expensive
Equipment needed	NIC, switch and hub	Modem and router	Microwave, radio, infra-red laser
Protocols	Attached Resource computer network (ARCNET), Token ring	Frame relay and asynchronous transfer mode(ATM)	ATM, FDDI, SMDS

b. Explain Go-back-N protocol **(5 Marks)**

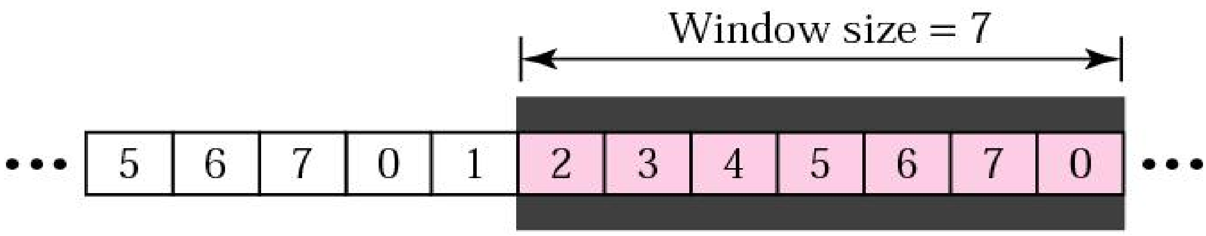
- Allows multiple frames to be sent before waiting for ACK
  - These frames must be numbered differently
  - Frame numbers are called Sequence numbers
- Frames must be received in the correct order
- If a frame is lost, the lost frame and all of the following frames must be retransmitted
- Frame header contains *m* bits for sequence number
- That allows up to 2^m different frame numbers
- Sending more than one frame at once requires sender to buffer multiple frames
  - Known as "sending window"
  - Any of these frames in the window can be lost



- Once the first frames in the window is ACKed
  - ACKed frames are removed from the buffer
  - More frames are transmitted
  - Result: The window slides to the right

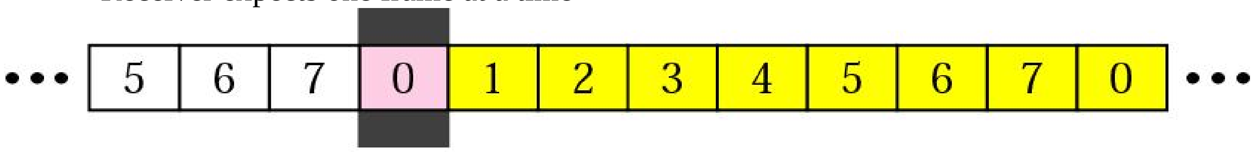


a. Before sliding

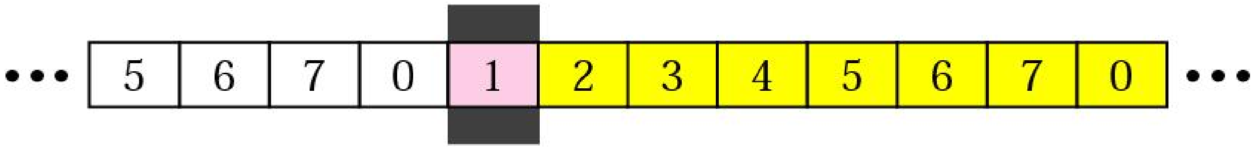


b. After sliding two frames

- Receiver expects one frame at a time



a. Before sliding



b. After sliding

4. Explain 2G mobile telephone systems. (10 Marks)

The second generation mobile phones works on digital voice. Switching to digital has several advantages. It provides capacity gains by allowing voice signals to be digitized and compressed. It improves security by allowing voice and control signals to be encrypted. It enables new services such as text messaging.

Different systems will be developed like DAMPs and GSM. CDMA technique is also used in this generation

GSM—The Global System for Mobile Communications

Fig. 2-46 shows that the GSM architecture is similar to the AMPS architecture, though the components have different names. The mobile itself is now divided into the handset and a removable chip with subscriber and account information called a **SIM card**, short for **Subscriber Identity Module**. It is the SIM card that activates the handset and contains secrets that let the mobile and the network identify each other and encrypt conversations. A SIM card can be removed and plugged into a different handset to turn that handset into your mobile as far as the network is concerned.

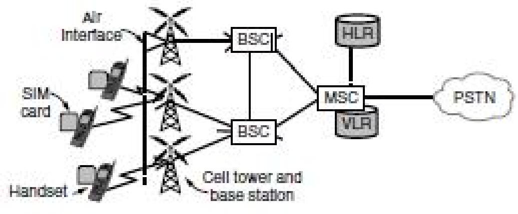


Figure 2-46. GSM mobile network architecture.

The mobile talks to cell base stations over an **air interface** that we will describe in a moment. The cell base stations are each connected to a **BSC** (**Base Station Controller**) that controls the radio resources of cells and handles handoff.
The BSC in turn is connected to an MSC (as in AMPS) that routes calls and connectsto the PSTN (Public Switched Telephone Network).To be able to route calls, the MSC needs to know where mobiles can currentlybe found. It maintains a database of nearby mobiles that are associated with thecells it manages. This database is called the **VLR** (**Visitor Location Register**).There is also a database in the mobile network that gives the last known locationof each mobile. It is called the **HLR** (**Home Location Register**). This data base issued to route incoming calls to the right locations. Both databases must be kept up to date as mobiles move from cell to cell.

5. With the help of neat diagram, explain any two guided transmission media. (10 Marks)

One of the oldest and still most common transmission media is **twisted pair**. A twisted pair consists of two insulated copper wires, typically about 1 mm thick. The wires are twisted together in a helical form, just like a DNA molecule. Twisting is done because two parallel wires constitute a fine antenna. When the wires are twisted, the waves from different twists cancel out, so the wire radiates less effectively. A signal is usually carried as the difference in voltage between the two wires in the pair. This provides better immunity to external noise because the noise tends to affect both wires the same, leaving the differential unchanged.

Twisted pairs can be used for transmitting either analog or digital information. The bandwidth depends on the thickness of the wire and the distance traveled, but several megabits/sec can be achieved for a few kilometers in many cases. Due to their adequate performance and low cost, twisted pairs are widely used and are
likely to remain so for years to come.

Category 5:

A category 5twisted pair consists of two insulated wires gently twisted together. Four suchpairs are typically grouped in a plastic sheath to protect the wires and keep them together. This arrangement is shown in Fig.

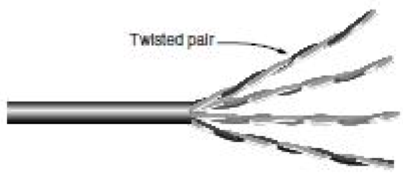


Figure 2-3. Category 5 UTP cable with four twisted pairs.

Category 3:

Category 3 cables with a similar cable that uses the same connector, but has more twists per meter. More twists result in less crosstalk and a better-quality signal over longer distances, making the cables more suitable for high-speed computer communication, especially100-Mbps and 1-Gbps Ethernet LANs.

Category 6 or Category 7:

These categories has more stringent specifications to handle signals with greater bandwidths. Some cables in Category 6 and above are rated for signals of 500 MHz and can support the 10-Gbps links that will soon be deployed

Coaxial Cable:

It has better shielding and greater bandwidth than unshielded twisted pairs, so it can span longer distances at higher speeds.

Two kinds of coaxial cable are widely used. 50-ohmcable, is commonly used when it is intended for digital transmission from the start. The other kind, 75-ohm cable, is commonly used for analog transmission and cable television. A coaxial cable consists of a stiff copper wire as the core, surrounded by an insulating material. The insulator is encased by a cylindrical conductor, often as a closely woven braided mesh. The outer conductor is covered in a protective plastic sheath. A cutaway view of a coaxial cable is shown in Fig. 2-4.

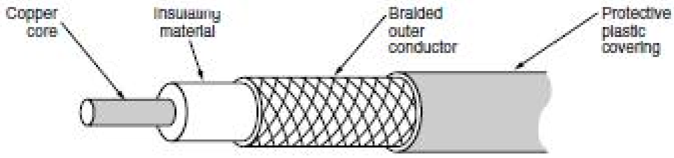


Figure 2-4. A coaxial cable.

6. a) Explain analog and Digital Transmission(5 Marks).

Analog transmission is a means of transmitting analog signals without regard to their content; the signals may represent analog data (e.g., voice) or digital data (e.g., binary data that pass through a modem). In either case, the analog signal will become weaker (attenuate) after a certain distance. To achieve longer distances, the analog transmission system includes amplifiers that boost the energy in the signal. Unfortunately, the amplifier also boosts the noise components. With amplifiers cascaded to achieve long distances, the signal becomes more and more distorted.

Digital transmission, in contrast, assumes a binary content to the signal. A digital signal can be transmitted only a limited distance before attenuation, noise, and other impairments endanger the integrity of the data. To achieve greater distances, repeaters are used. A repeater receives the digital signal, recovers the pattern of 1s and 0s, and retransmits a new signal. Thus the attenuation is overcome.

The digital transmission is beneficial over analog transmission because of the following reasons.

• Digital technology: The advent of large-scale integration (LSI) and very-largescale integration (VLSI) technology has caused a continuing drop in the cost and size of digital circuitry.

• Data integrity: With the use of repeaters rather than amplifiers, the effects of noise and other signal impairments are not cumulative. Thus it is possible to transmit data longer distances and over lower quality lines by digital means while maintaining the integrity of the data.

• Capacity utilization: It has become economical to build transmission links of very high bandwidth, including satellite channels and optical fiber. A high degree of multiplexing is needed to utilize such capacity effectively, and this is more easily and cheaply achieved with digital (time division) rather than analog (frequency division) techniques.

• Security and privacy: Encryption techniques can be readily applied to digital data and to analog data that have been digitized

. • Integration: By treating both analog and digital data digitally, all signals have the same form and can be treated similarly. Thus economies of scale and convenience can be achieved by integrating voice, video, and digital data.

b) Explain Transmission Impairments. (5 Marks).

With any communications system, the signal that is received may differ from the signal that is transmitted due to various transmission impairments. For analog signals, these impairments can degrade the signal quality. For digital signals, bit errors may be introduced, such that a binary 1 is transformed into a binary 0 or vice versa

The most significant impairments are

• Attenuation

• Delay distortion

• Noise

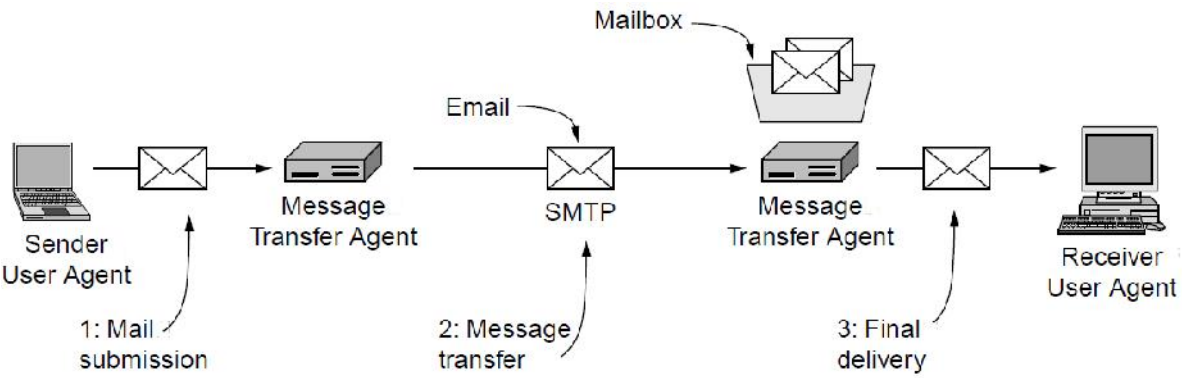
Attenuation : The strength of a signal falls off with distance over any transmission medium. For guided media, this reduction in strength, or attenuation, is generally exponential and thus is typically expressed as a constant number of decibels per unit distance. For unguided media, attenuation is a more complex function of distance and the makeup of the atmosphere. Attenuation introduces three considerations for the transmission engineer. First, a received signal must have sufficient strength so that the electronic circuitry in the receiver can detect the signal. Second, the signal must maintain a level sufficiently higher than noise to be received without error. Third, attenuation varies with frequency

Delay Distortion: Delay distortion occurs because the velocity of propagation of a signal through a guided medium varies with frequency. For a band limited signal, the velocity tends to be highest near the center frequency and fall off toward the two edges of the band. Thus various frequency components of a signal will arrive at the receiver at different times, resulting in phase shifts between the different frequencies

Noise: For any data transmission event, the received signal will consist of the transmitted signal, modified by the various distortions imposed by the transmission system, plus additional unwanted signals that are inserted somewhere between transmission and reception. The latter, undesired signals are referred to as noise. Noise is the major limiting factor in communications system performance. Noise may be divided into four categories: • Thermal noise • Intermodulation noise • Crosstalk • Impulse noise

7. Explain the architecture of email system. (10 Marks)

The architecture of the email system is shown inFig. It consists of two kinds of subsystems: the **user agents**, which allowpeople to read and send email, and the **message transfer agents**, which move the messages from the source to the destination. We will also refer to message transfer agents informally as **mail servers**.



The user agent is a program that provides a graphical interface, or sometimes a text- and command-based interface that lets users interact with the email system. It includes a means to compose messages and replies to messages, display incoming messages, and organize messages by filing, searching, and discarding them. The act of sending new messages into the mail system for delivery is called **mail submission**.
Some of the user agent processing may be done automatically, anticipating what the user wants. For example, incoming mail may be filtered to extract or deprioritize messages that are likely spam. Some user agents include advanced features, such as arranging for automatic email .A user agent runs on the same computer on which a user reads her mail. It is just another program and may be run only some of the time.
The message transfer agents are typically system processes. They run in the background on mail server machines and are intended to be always available.Their job is to automatically move email through the system from the originator to the recipient with **SMTP** (**Simple Mail Transfer Protocol**). This is the message transfer step.
Message transfer agents also implement **mailing lists**, in which an identical copy of a message is delivered to everyone on a list of email addresses. Other advanced features are carbon copies, blind carbon copies, high-priority email, secret (i.e., encrypted) email, alternative recipients if the primary one is not currently available, and the ability for assistants to read and answer their bosses' email. Linking user agents and message transfer agents are the concepts of mailboxes and a standard format for email messages. **Mailboxes** store the email that is received for a user. They are maintained by mail servers. User agents simply present users with a view of the contents of their mailboxes. To do this, the user agents send the mail servers commands to manipulate the mailboxes, inspecting their contents, deleting messages, and so on. The retrieval of mail is the final delivery (step 3) in Fig. With this architecture, one user may use different user agents on multiple computers to access one mailbox.Mail is sent between message transfer agents in a standard format.