University of Sargodha

BS 3rd Term Examination 2017,

Subject: Computer Science **Paper: Computer Communication & Network (CMP: 2540)**

Time Allowed: 2:30 Hours

Maximum Marks: 80

Objective Part Compulsory 81

Q-1: Answer the following question briefly.

2x16 = 32

1. What are the components of data communication system?
2. What is compression? Which layer is responsible for compression?
3. What is reflection?
4. What type of addresses are used in Network and Data Link layer?
5. Define digital to analog conversion.
6. How does sky propagation differ from line-of-sight propagation?
7. What is the goal of multiplexing?
8. Difference between Half-duplex and full-duplex?
9. Define two main categories of network.
10. Which connectors are used in fiber optic cable?
11. What are the two types of line configuration?
12. Define infrared waves. Give an example.
13. What is handoff?
14. what is the difference between switch and router?
15. Why are protocols needed?
16. How does single bit error differ from burst error?

Subjective

Attempt any four (4) questions

Q-2: Explain OSI model with functionality of each layer

4x12 = 48

Q-3 Discuss the steps involved in a typical call originated from a mobile user to a fixed subscriber.

Q-4: What are the advantages and disadvantages of fiber optic cable?

Q-5: Discuss radio waves and microwaves.

Q-6: Discuss the techniques used in serial transmission

Q-7: Discuss transmission impairments in detail.

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Subject: Computer Science   **Paper: Computer Communication & Networks (CMP-2540)**

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Q.No.1: Attempt all parts and each require answer 2 – 3 lines   **(16*2=32)**

1- What are the components of data communication system?

There are five basic components of data communication:

1-Message	2-Receiver	3-Transmission Medium
4-Sender	5-Protocols	

2- What is compression? Which layer is responsible for compression?

Data compression is a reduction in the number of bits needed to represent data. Compressing data can save storage capacity, speed up file transfer, and decrease costs for storage hardware and network bandwidth. Presentation layer is responsible for compression of data.

3- What is reflection?

Reflection is the change in direction of a wavefront at an interface between two different media so that the wavefront returns into the medium from which it originated. Common examples include the reflection of light, sound and water waves.

4- What types of addresses are used in network and data link layer?

Datalink layers uses physical addressing (MAC Address) and Network layer uses IP addressing and some other protocols to use logical addressing like DHCP and ARP.

5- Define Digital to analog conversion.

When data from one computer is sent to another via some analog carrier, it is first converted into analog signals. Analog signals are modified to reflect digital data. An analog signal is characterized by its amplitude, frequency, and phase. There are three kinds of digital-to-analog conversions:

Amplitude Shift Keying (ASK)   Frequency Shift Keying (FSK)

Phase Shift Keying (PSK)

6- How does sky propagation differ from line of sight propagation?

Sky Propagation: In sky propagation, higher-frequency radio waves radiate upward into the ionosphere (the layer of atmosphere where particles exist as ions) where they are reflected back to earth. This type of transmission allows for greater distances with lower output power.

Line of Sight Propagation: In line-of-sight propagation, very high-frequency signals are transmitted in straight lines directly from antenna to antenna. Antennas must be directional, facing each other and either tall enough or close enough together not to be affected by the curvature of the earth. Line-of sight propagation is tricky because radio transmissions cannot be completely focused.

7- What is the goal of multiplexing?

In telecommunications and computer networks, **multiplexing** (sometimes contracted to muxing) is a method by which multiple analog or digital signals are combined into one signal over a shared medium. The **purpose of multiplexing** is to enable signals to be transmitted more efficiently over a given communication channel, thereby decreasing transmission costs.

8- Difference between half duplex and full duplex.

In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device is sending, the other can only receive, and vice versa. The half-duplex mode is used in cases where there is no need for communication in both directions at the same time; the entire capacity of the channel can be utilized for each direction.

In full-duplex mode (also called duplex), both stations can transmit and receive simultaneously. The full-duplex mode is used when communication in both directions is required all the time. The capacity of the channel, however, must be divided between the two directions.

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9- Define two main categories of network.

LAN: A local area network (LAN) is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, university campus or office building.

WAN: A wide area network is a telecommunications network or computer network that extends over a large geographical distance. A WAN connects different smaller networks.

10- Which connectors are used in fiber optic cable?

SC (Subscriber Channel), ST (Straight Tip) and MTRJ are popular connectors used in fiber optic cable.

11- What are the two types of line configuration?

There are following types of line configurations:

Point-To-Point: A point-to-point connection provides a dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices.

MultiPoint: A multipoint (also called multidrop) connection is one in which more than two specific devices share a single link.

12- Define infrared waves? Give an example.

Infrared waves, with frequencies from 300 GHz to 400 THz (wavelengths from 1 mm to 770 nm), can be used for short-range communication. Infrared waves, having high frequencies, cannot penetrate walls. Signals of TV remote is an example of infrared waves.

13- What is handoff?

A handoff refers to the process of transferring an active call or data session from one cell to another in cellular network communication. There are two types of handoff, Soft handoff & Hard handoff.

14- What is the difference between switch and router?

Router: The router forwards data packets along networks. It is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network. Routers are located at gateways, the places where two or more networks connect. Routers use headers and forwarding tables to determine the best path for forwarding the packets, and they use protocols to communicate with each other and configure the best route between any two hosts. It is operate Network Layer (3rd Layer).

Switch: In networks the switch is the device that filters and forwards packets between LAN segments. A network switch (also called switching hub, bridging hub, officially MAC bridge) is a computer networking device that connects devices together on a computer network by using packet switching to receive, process, and forward data to the destination device. It is operated at Data Link Layer (2nd Layer).

15- Why protocols are needed?

Network protocols were created to allow computers to communicate in an organized manner without any room for misinterpretation. These rules determine things like packet format, type and size. They also determine what happens when an error occurs, and which part of the network is supposed to handle the error and how.

16- How does single bit error differ from burst error?

The Term Single-Bit error means that only 1 bit of a given data unit (such as a byte, character, or packet) is changed from 1 to 0 or from 0 to 1. In case of burst error, if two or more bits from a data unit such as byte change from 1 to 0 or from 0 to 1 then burst errors are said to have occurred. In burst error, it is not necessary that only consecutive bits are changed.

Subjective Part

Q 2. Explain OSI Model with functionality of each layer.

Although, when speaking of the Internet, everyone talks about the TCP/IP protocol suite, this suite is not the only suite of protocols defined. Established in 1947, the International Organization for Standardization (ISO) is a multinational body dedicated to worldwide agreement on international standards. Almost three-fourths of the countries in the world are represented in the ISO. An ISO standard that covers all aspects of network communications is the Open Systems Interconnection (OSI) model. It was first introduced in the late 1970s. An open system is a set of protocols that allows any two different systems to communicate regardless of their underlying architecture. The

purpose of the OSI model is to show how to facilitate communication between different systems without requiring changes to the logic of the underlying hardware and software. The OSI model is not a protocol; it is a model for understanding and designing a network architecture that is flexible, robust, and interoperable. The OSI model was intended to be the basis for the creation of the protocols in the OSI stack. The OSI model is a layered framework for the design of network systems that allows communication between all types of computer systems. It consists of seven separate but related layers, each of which defines a part of the process of moving information across a network.

{ISO is the organization; OSI is the model}

1. Physical Layer

The physical layer covers the physical interface between a data transmission device (e.g., workstation, computer) and a transmission medium or network. This layer is concerned with specifying the characteristics of the transmission medium, the nature of the signals, the data rate, and related matters. TCP/IP does not define any specific protocol for the physical layer. It supports all of the standard and proprietary protocols. To be transmitted, bits must be encoded into signals— electrical or optical. The physical layer defines the type of encoding (how 0s and 1s are changed to signals).

2. Data Link Layer

The unit of communication however, is a packet called a frame. A frame is a packet that encapsulates the data received from the network layer with an added header and sometimes a trailer. The head includes the source and destination of frame. The destination address is needed to define the right recipient of the frame. The source address is needed for possible response or acknowledgment as may be required by some protocols. TCP/IP does not define any specific protocol for the data link layer either. It supports all of the standard and proprietary protocols.

3. Network Layer

The network layer is responsible for creating a connection between the source computer and the destination computer. The communication at the network layer is host-to-host. However, since there can be several routers from the source to the destination, the routers in the path are responsible for choosing the best route for each packet. We can say that the network layer is responsible for host-to-host communication and routing the packet through possible routes. Protocols of Network Layers are as follows:

> **IP**

Internet Protocol (IP), that defines the format of the packet, called a datagram at the network layer. IP also defines the format and the structure of addresses used in this layer. IP is also responsible for routing a packet from its source to its destination, which is achieved by each router forwarding the datagram to the next router in its path. There two versions of IP, Ipv4 and IPv6. **IP is a connectionless protocol that provides no flow control, no error control, and no congestion control services.** The network layer also has some auxiliary protocols that help IP in its delivery and routing tasks.

> **ICMP**

ICMP is Internet Control Message Protocol. The Internet Control Message Protocol (ICMP) helps IP to report some problems when routing a packet.

> **IGMP**

IGMP is Internet Group Management Protocol. The Internet Group Management Protocol (IGMP) is another protocol that helps IP in multitasking.

> **DHCP**

DHCP means Dynamic Host Configuration Protocol. It is used to get IP Address for a host in network layer.

> **ARP**

It is Address Resolution Protocol. The Address Resolution Protocol (ARP) is a protocol that helps IP to find the link-layer address of a host or a router when its network-layer address is given.

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4. Transport Layer

The network layer is responsible for sending individual datagrams from computer A to computer B; the transport layer is responsible for delivering the whole message, which is called a Segment, a user datagram, or a packet, from A to B. A segment may consist of a few or tens of datagrams. The segments need to be broken into datagrams and each datagram has to be delivered to the network layer for transmission.

Since the Internet defines a different route for each datagram, the datagrams may arrive out of order and maybe lost. The transport layer at computer B needs to wait until all of these datagrams to arrive, assemble them and make a segment out of them.

> **TCP:** Transmission Control Protocol is a connection oriented protocol used by transport layer. It is a one-to-one reliable communication service. It is responsible of establishment of network, sequencing, acknowledgement and recovery of data packets.
> **UDP:** User Datagram Protocol is a connection less protocol used by transport layer. It is unreliable service, used when the amount of data to be transferred is small.

5. Application Layer

The application layer enables the user, whether human or software, to access the network. It provides user interfaces and support for services such as electronic mail, remote file access and transfer, shared database management, and other types of distributed information services.

> HTTP: Hyper Text Transfer Protocol is used to transfer files that makes up the Web pages of World Wide Web.
> FTP: File Transfer Protocol is used to transfer files over the network
> DNS: Domain Name System is used to assign names to IP address of websites. So it can be remembered easily.
> SMTP: Simple Mail Transfer Protocol is used to send and receive mails over the network.
> TELNET: It is a terminal emulation protocol, is used for logging on remotely to network hosts.

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Q3. Discuss the steps involved in a typical call originated from a mobile user to a fixed subscriber.
Page 472 on "Data Communication & Network" by Forouzan, Behrouz 5th Edition

Q4. What are the advantages and disadvantages of fiber optic cable?
Page 197 on "Data Communication & Network" by Forouzan, Behrouz 5th Edition

Q5. Discuss radio waves and microwaves.
Page 199 on "Data Communication & Network" by Forouzan, Behrouz 5th Edition

Q6. Discuss the techniques used in serial transmission.
Page 126 on "Data Communication & Network" by Forouzan, Behrouz 5th Edition

Q7. Discuss transmission impairments in detail.
Page 76 on "Data Communication & Network" by Forouzan, Behrouz 5th Edition