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Internal Assessment Test 1 –
Nov 2024

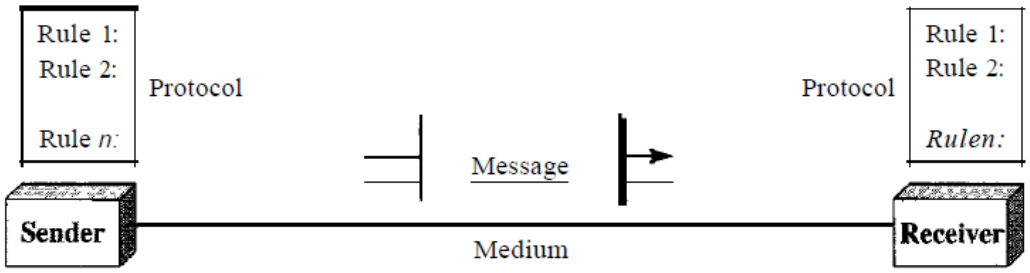
Sub:	**Computer Networks**					Sub Code:	**BCS502**	Branch:	**AINDS / CS (DS)**
Date:	**11/11/2024**	Duration:	**90 minutes**	Max Marks:	**50**	Sem	**V**		**OBE**

		Answer any FIVE Questions	**MARKS**	**CO**	**RBT**
1	a	Explain Different Components of Communication System with neat diagram.	6	CO1	L1
	b	Explain CSMA/CD in detail. Whether it is used in Wireless or Wired Communication	4	C2	L2
2	a	Compare and contrast HDLC with PPP. Which one is byte-oriented; which one is bit-oriented?	5	CO2	L2
	b	Compare and contrast byte-stuffing and bit-stuffing. Which technique is used in byte-oriented protocols? Which technique is used in bit-oriented protocols?	5	CO2	L2
3	a	How do the layers of the Internet model correlate to the layers of the OSI model?	7	CO2	L2
	b	What is the difference between a port address, a logical address, and a physical address?	3	CO1	L2
4	a	Differentiate between Guided and Unguided media	4	CO2	L2
	b	Explain Single and Multi-mode operations in Fiber Optics	6	CO2	L1
5		Given the dataword 1010011110 and the divisor 10111, a. Show the generation of the codeword at the sender site (using binary division). b. Show the checking of the codeword at the receiver site (assume no error).	10	CO2	L3
6		A sender needs to send the four data items Ox3456, OxABCC, Ox02BC, and OxEEEE. Answer the following: a. Find the checksum at the sender site. b. Find the checksum at the receiver site if the second data item is changed	10	CO3	L3

		to OxABCE.			

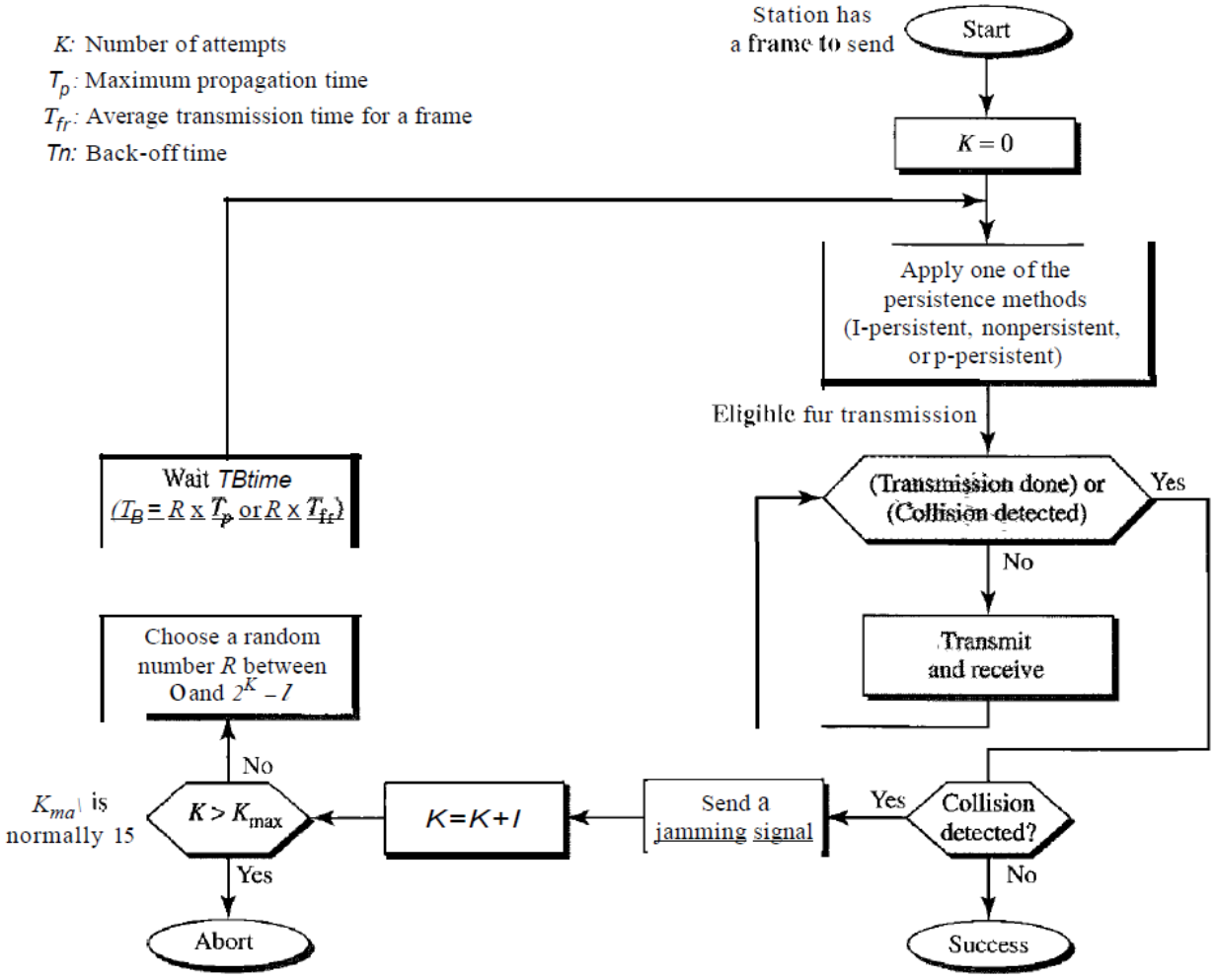
CI CCI HOD

Q 1a) Explain Different Components of Communication System with neat diagram.



1) Message. The message is the information (data) to be communicated. Popular forms of information include text, numbers, pictures, audio, and video.
I2) Sender. The sender is the device that sends the data message. It can be a computer, workstation, telephone handset, video camera, and so on.
3. Receiver. The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.
-1.. Transmission medium. The transmission medium is the physical path by which a message travels from sender to receiver. Some examples of transmission media include twisted-pair wire, coaxial cable, fiber-optic cable, and radio waves.
SECTION 1.1 *DATA COMMUNICATIONS 5*
5. Protocol. A protocol is a set of rules that govern data communications. It represents an agreement between the communicating devices. Without a protocol, two devices may be connected but not communicating, just as a person speaking French cannot be understood by a person who speaks only Japanese.

Q 1 b) Explain CSMA/CD in detail. Whether it is used in Wireless or Wired Communication



In this method, a station monitors the medium after it sends a frame to see if the transmission was successful. If so, the station is finished. If, however, there is a collision, the frame is sent again.

To better understand CSMA/CD, let us look at the first bits transmitted by the two stations involved in the collision. Although each station continues to send bits in the

frame until it detects the collision,

It is similar to the

one for the ALOHA protocol, but there are differences.

The first difference is the addition of the persistence process. We need to sense the channel before we start sending the frame by using one of the persistence processes we discussed previously (nonpersistent, I-persistent, or p-persistent). The corresponding box can be replaced by one of the persistence processes shown in figure. The second difference is the frame transmission. In ALOHA, we first transmit the

entire frame and then wait for an acknowledgment. In *CSMA/CD,* transmission and collision detection is a continuous process. The third difference is the sending of a short jamming signal that enforces the collision

in case other stations have not yet sensed the collision.

It is used in Wired

Q 2 a) Compare and contrast HDLC with PPP. Which one is byte-oriented; which one is bit-oriented?

High-level Data Link Control (HDLC) is a bit-oriented protocol for communication over point-to-point and multipoint links. HDLC provides two common transfer modes that can be used in different configurations:
normal response mode (NRM) and asynchronous balanced mode (ABM). HDLC defines three types of frames: information frames
(I-frames), supervisory frames (S-frames), and unnumbered frames (V-frames). Each type of frame serves as an envelope for the transmission of a different type of message. I-frames are used to transport user data and control information relating to user data (piggybacking). S-frames are used only to transport control information. V-frames are reserved for system management. Information carried by V-frames is intended for managing the link itself.

PPP
one of the most common protocols for point-to-point access is the Point-to-Point Protocol (PPP). Today, millions of Internet users who need to connect their home computers to the server of an Internet service provider use PPP. The majority of these users have a traditional modem; they are connected to the Internet through a telephone line, which provides the services of the physical layer. PPP provides several services:
1. PPP defines the format of the frame to be exchanged between devices.
2. PPP defines how two devices can negotiate the establishment of the link and the exchange of data.
3. PPP defines how network layer data are encapsulated in the data link frame.
4. PPP defines how two devices can authenticate each other.
5. PPP provides multiple network layer services supporting a variety of network layer protocols.
6. PPP provides connections over multiple links.
7. PPP provides network address configuration. This is particularly useful when a home user needs a temporary network address to connect to the Internet.
On the other hand, to keep PPP simple, several services are missing:
I. PPP does not provide flow control. A sender can send several frames one after another with no concern about overwhelming the receiver.
2. PPP has a very simple mechanism for error control. A CRC field is used to detect errors. If the frame is corrupted, it is silently discarded; the upper-layer protocol needs to take care of the problem. Lack of error control and sequence numbering may cause a packet to be received out of order.
3. PPP does not provide a sophisticated addressing mechanism to handle frames in a multipoint configuration.

PPP is a byte-oriented protocol.

Q 2 b) Compare and contrast byte-stuffing and bit-stuffing. Which technique is used in byte-oriented protocols? Which technique is used in bit-oriented protocols?
In byte stuffing (or character stuffing), a special byte is added to the data section of the frame when there is a character with the same pattern as the flag. The data section is stuffed with an extra byte. This byte is usually called the escape character (ESC), which has a predefined bit pattern. Whenever the receiver encounters the ESC character, it removes it from the data section and treats the next character as data, not a delimiting flag. Byte stuffing by the escape character allows the presence of the flag in the data section
of the frame, but it creates another problem. What happens if the text contains one or more escape characters followed by a flag? The receiver removes the escape character,

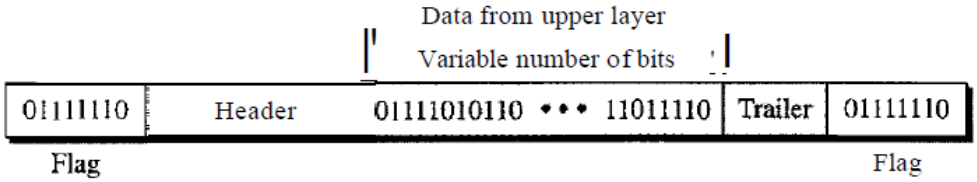
but keeps the flag, which is incorrectly interpreted as the end of the frame. To solve this problem, the escape characters that are part of the text must also be marked by another escape character. In other words, if the escape character is part of the text, an extra one is

added to show that the second one is part of the text.

Bit-Oriented Protocols

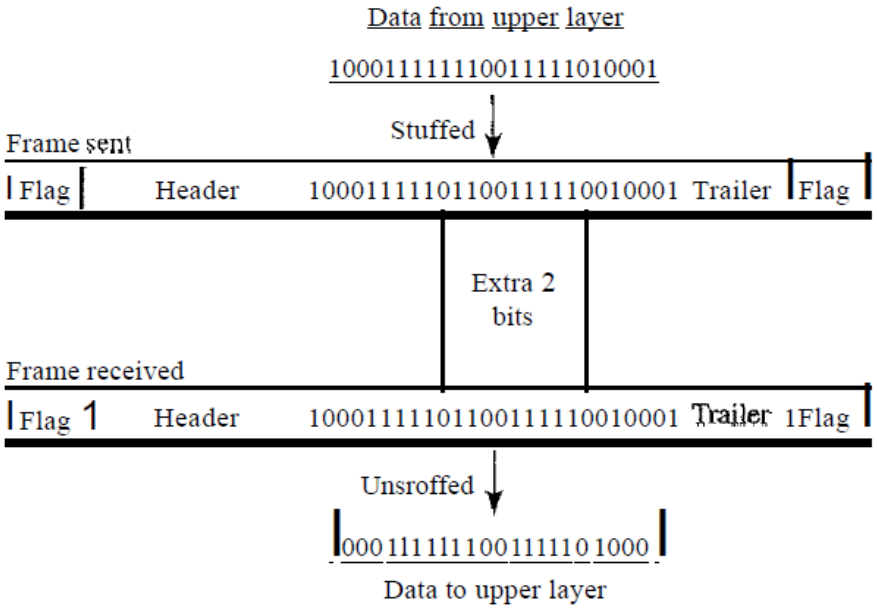
In a bit-oriented protocol, the data section of a frame is a sequence of bits to be interpreted by the upper layer as text, graphic, audio, video, and so on. However, in addition to headers (and possible trailers), we still need a delimiter to separate one frame from the other. Most protocols use a special 8-bit pattern flag 01111110 as the delimiter to

define the beginning and the end of the frame



This flag can create the same type of problem we saw in the byte-oriented protocols. That is, if the flag pattern appears in the data, we need to somehow inform the receiver that this is not the end of the frame. We do this by stuffing 1 single bit (instead of I byte) to prevent the pattern from looking like a flag. The strategy is called bit stuffing. In bit stuffing, if a 0 and five consecutive I bits are encountered, an extra 0 is

added. This extra stuffed bit is eventually removed from the data by the receiver.

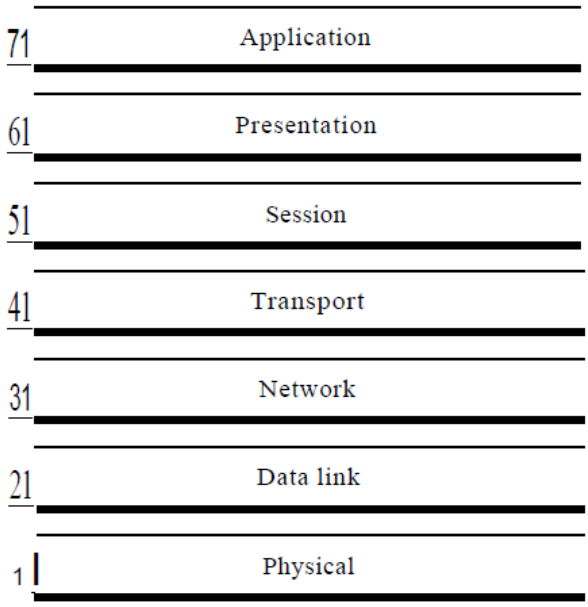


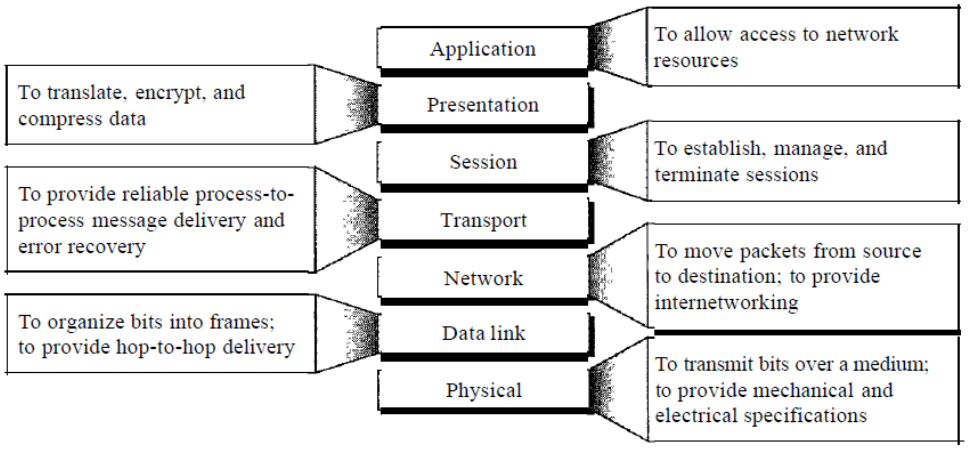
Q 3 a) How do the layers of the Internet model correlate to the layers of the OSI model?

OSI Model

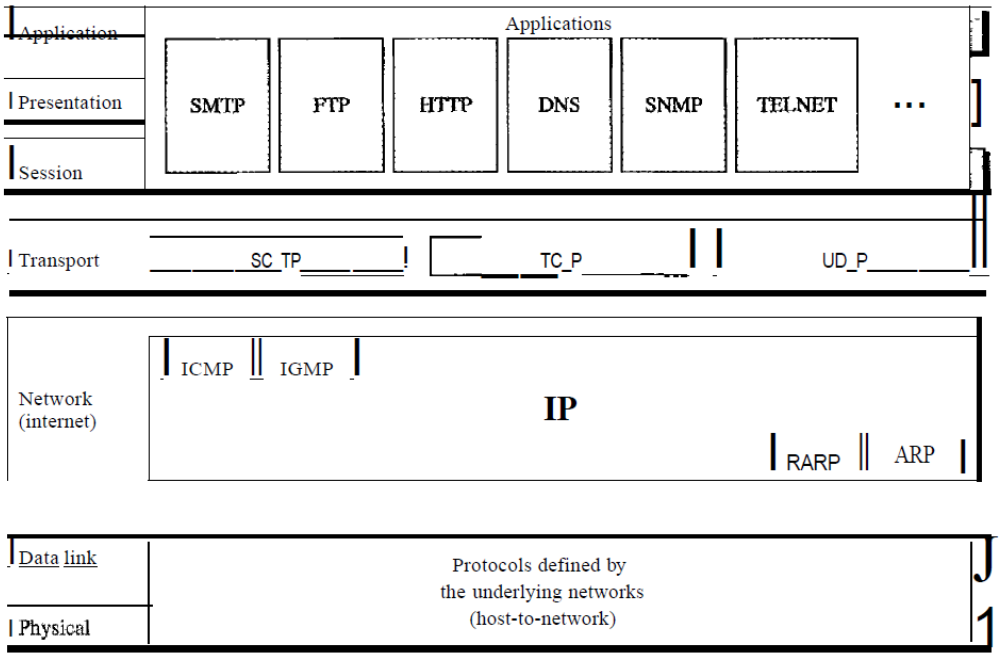
THE OSI MODELEstablished in 1947, the International Standards Organization (ISO) is a multinational body dedicated to worldwide agreement on international standards. An ISO standard that covers all aspects of network communications is the Open Systems Interconnection model. It was first introduced in the late 1970s. 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 (see Figure 2.2). An understanding of the fundamentals of the OSI model provides a solid basis for exploring data communications.





The TCPIIP protocol suite was developed prior to the OSI model. Therefore, the layers in the TCP/IP protocol suite do not exactly match those in the OSI model. The original TCP/IP protocol suite was defined as having four layers: host-to-network, internet, transport, and application. However, when TCP/IP is compared to OSI, we can say that the host-to-network layer is equivalent to the combination of the physical and data link layers. The internet layer is equivalent to the network layer, and the application layer is roughly doing the job of the session, presentation, and application layers with the transport layer in TCPIIP taking care of part of the duties of the session layer. TCPIIP protocol suite is made of five layers: physical,
data link, network, transport, and application. The first four layers provide physical standards, network interfaces, internetworking, and transport functions that correspond to the first four layers of the OSI model. The three topmost layers in the OSI model, however, are represented in TCPIIP by a single layer called the *application layer*



TCP/IP is a hierarchical protocol made up of interactive modules, each of which provides a specific functionality; however, the modules are not necessarily interdependent. Whereas the OSI model specifies which functions belong to each of its layers, the layers of the *TCP/IP* protocol suite contain relatively independent protocols that can be mixed and matched depending on the needs of the system. The term *hierarchical* means that each upper-level protocol is supported by one or more lower-level protocols.

At the transport layer, *TCP/IP* defines three protocols: Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Stream Control Transmission Protocol (SCTP). At the network layer, the main protocol defined by TCP/IP is the Internetworking Protocol (IP); there are also some other protocols that support data movement in this layer.

Q 3 b) What is the difference between a port address, a logical address, and a physical address?

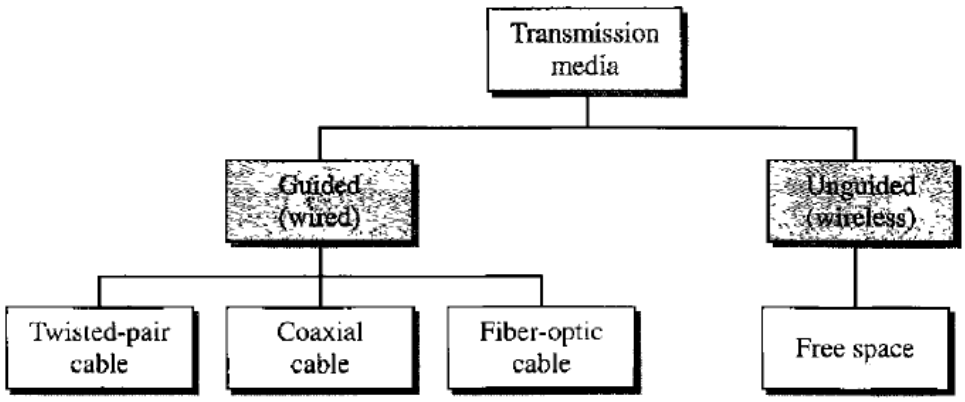
Port address is used at Transport layer. It distinguishes applications at sender and receiver. It is of 16 bit long.

For example HTTP has port address 80

Logical address, it is also called as IP address. It is used at Network layer. It is of 32 bit long and it is used to identify machine or device over a network.

Physical address is also called as MAC address. It is used at Data link layer. It is permanent address and cant be changed. It is of 128 bit long.

Q 4 a) Differentiate between Guided and Unguided media

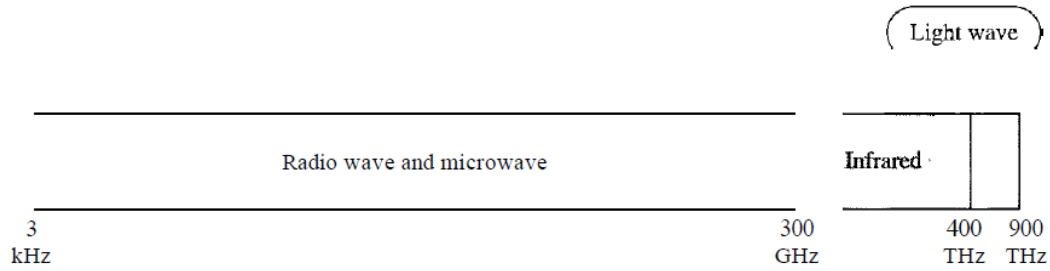


Guided media, which are those that provide a conduit from one device to another, include twisted-pair cable, coaxial cable, and fiber-optic cable. A signal traveling along any of these media is directed and contained by the physical limits of the medium. Twisted-pair and coaxial cable use metallic (copper) conductors that accept and transport signals in the form of electric current. Optical fiber is a cable that accepts and transports signals in the form of light.

UNGUIDED MEDIA: WIRELESS

Unguided media transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication. Signals are normally broadcast through free space and thus are available to anyone who has a device capable of receiving them.

Figure 7.17 shows the part of the electromagnetic spectrum, ranging from 3 kHz to 900 THz, used for wireless communication



Unguided signals can travel from the source to destination in several ways: ground propagation, sky propagation, and line-of-sight propagation,

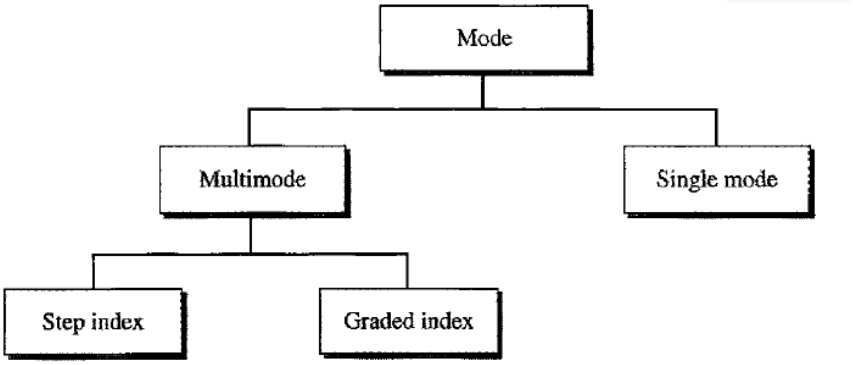
In ground propagation, radio waves travel through the lowest portion of the atmosphere, hugging the earth. These low-frequency signals emanate in all directions from the transmitting antenna and follow the curvature of the planet. Distance depends on the amount of power in the signal: The greater the power, the greater the distance. 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.

In line-or-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.

Q 4 b) Explain Single and Multi-mode operations in Fiber Optics

Propagation Modes

Current technology supports two modes (multimode and single mode) for propagating light along optical channels, each requiring fiber with different physical characteristics. Multimode can be implemented in two forms: step-index or graded-index

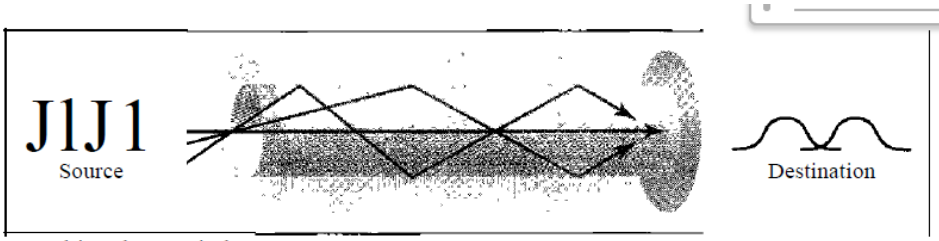


Multimode Multimode is so named because multiple beams from a light source move through the core in different paths. How these beams move within the cable depends on the structure ofthe core, as shown in Figure 7.13.

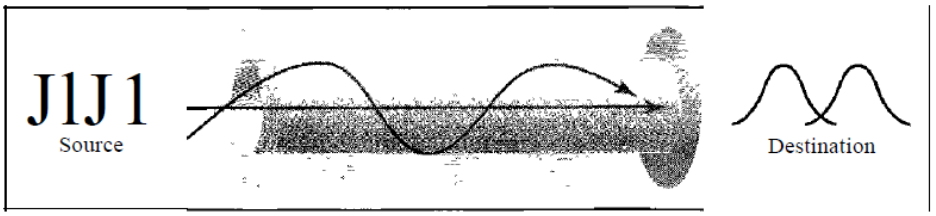
In multimode step-index fiber, the density of the core remains constant from the center to the edges. A beam of light moves through this constant density in a straight line until it reaches the interface of the core and the cladding. At the interface, there is an abrupt change due to a lower density; this alters the angle of the beam's motion. The term *step index* refers to the suddenness of this change, which contributes to the distortion of the signal as it passes through the fiber.

A second type of fiber, called multimode graded-index fiber, decreases this distortion of the signal through the cable. The word *index* here refers to the index of refraction. As we saw above, the index of refraction is related to density. A graded-index fiber, therefore, is one with varying densities. Density is highest at the center of the core and decreases gradually to its lowest at the edge. Figure 7.13 shows the impact of this variable density on the propagation of light beams.

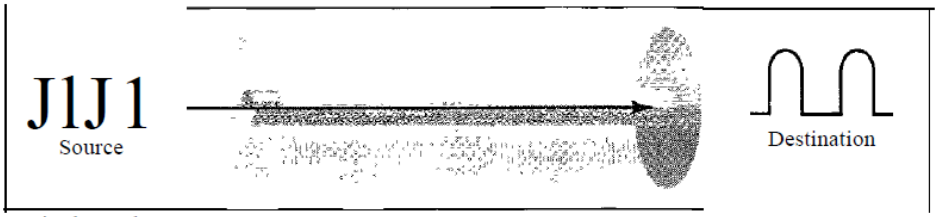
Single-Mode Single-mode uses step-index fiber and a highly focused source of light that limits beams to a small range of angles, all close to the horizontal. The singlemode fiber itself is manufactured with a much smaller diameter than that of multimode fiber, and with substantiallY lower density (index of refraction). The decrease in density results in a critical angle that is close enough to 90° to make the propagation of beams almost horizontal.



a. Multimode, step index



b. Multimode, graded index



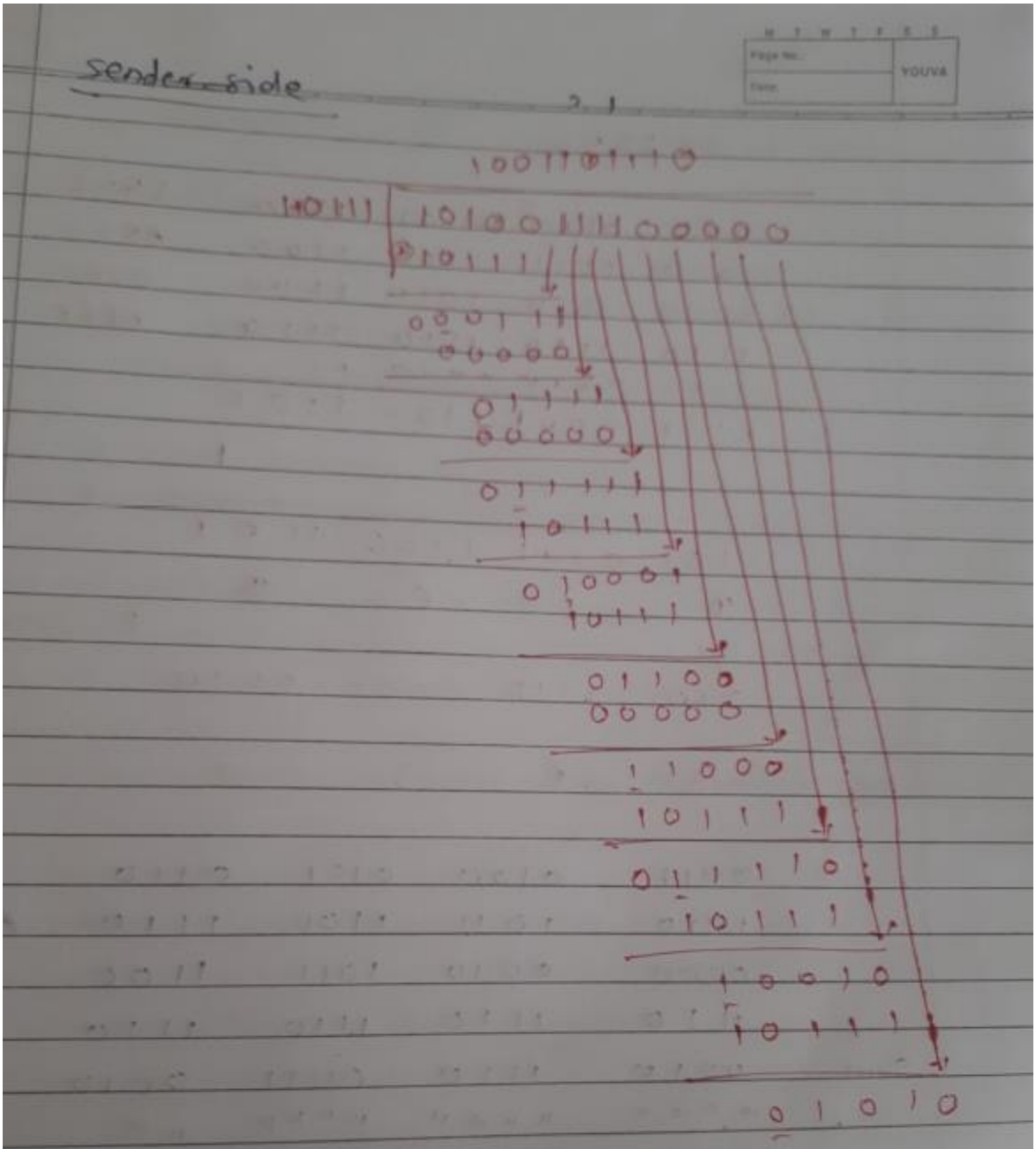
c. Single mode

Q 5) Given the dataword 1010011110 and the divisor 10111,

a. Show the generation of the codeword at the sender site (using binary division).

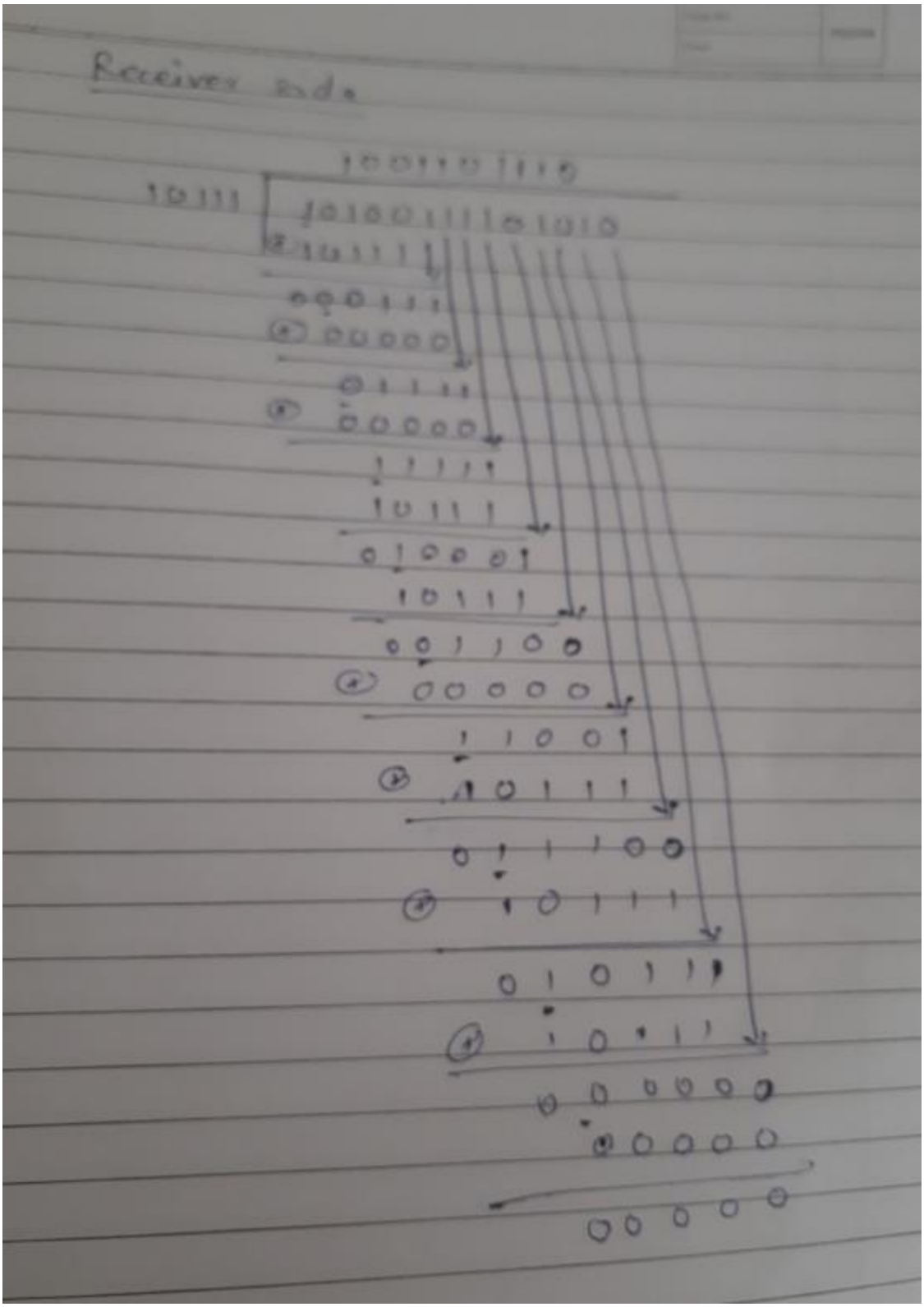
b. Show the checking of the codeword at the receiver site (assume no error).

sender side



Syndrome = 1010

codeword = 10100111101010



Thus, here syndrome is 0000 so receiver will accept this dataword.

Q 6) A sender needs to send the four data items Ox3456, OxABCC, Ox02BC, and OxEEEE. Answer the following:

a. Find the checksum at the sender site.

Find the checksum at the receiver site if the second data item is changed to OxABCE.