Name: Obeng Hamza

Index: 4235230034

Program: Computer science (Group A)

Session: Evening

Question 1

Explain the following.

a. Parallel transmission

b. Asynchronous transmission

c. Synchronous transmission

d. Isochronous transmission

a. Parallel Transmission:

• In parallel transmission, multiple bits of data are sent simultaneously over multiple wires

or channels.

• Each bit of the data is sent on a separate wire, and all bits of a character (or data unit) are

transmitted simultaneously.

• This method allows for faster data transfer rates compared to serial transmission, as

multiple bits are transmitted at once.

• Parallel transmission is commonly used in computer buses and interconnecting

components within a computer system, such as between the CPU and memory.

b. Asynchronous Transmission:

• In asynchronous transmission, data is sent one character at a time, with individual

characters being preceded by start and stop bits.

• The timing of each character is not synchronized with a clock signal; instead, each

character is sent independently.

• Asynchronous transmission is often used in serial communication, such as RS-232, where

the data transfer rate may vary and synchronization between sender and receiver is

achieved through the start and stop bits.

c. Synchronous Transmission:

• In synchronous transmission, data is transmitted in a continuous stream without start and

stop bits for each character.

• The timing of the data transmission is synchronized between the sender and receiver

using a clock signal.

• Synchronous transmission typically requires a higher level of coordination between

sender and receiver compared to asynchronous transmission but can achieve higher data

transfer rates and is more efficient for large amounts of data.

d. Isochronous Transmission:

• Isochronous transmission is a form of synchronous transmission where data is sent at a

constant rate.

• Unlike synchronous transmission, where the timing is synchronized but the data rate may

vary, isochronous transmission maintains a constant data rate.

• Isochronous transmission is commonly used for real-time data transfer applications, such

as audio and video streaming, where maintaining a consistent data rate is essential to

avoid buffering or latency issues.

Question 2

What tasks are performed by the transport layer?

The transport layer in the OSI (Open Systems Interconnection) model and the TCP/IP model is

responsible for several key tasks to ensure reliable and efficient communication between network

hosts. Some of the main tasks performed by the transport layer include:

1. Segmentation and Reassembly: The transport layer breaks down data from the upper

layers into smaller units called segments before transmission over the network. Upon

receipt, it reassembles these segments into the original data.

2. Connection Establishment and Termination: Depending on the protocol (e.g., TCP),

the transport layer establishes and manages connections between communicating hosts. It

handles the three-way handshake process for connection establishment and ensures

proper connection termination when communication is complete.

Question 3

A broadcast network is one in which a transmission from any one attached stationn is received by

all other attached stations over a shared medium. Examples are a bustopology local area network,

such as Ethernet, and a wireless radio network. Discuss the need or lack of need for a network

layer (OSI layer 3) in a broadcast network.

In a broadcast network where all stations can receive transmissions from any other station over a

shared medium, the need for a network layer (OSI layer 3) depends on several factors:

1. Addressing and Routing: In a broadcast network, all stations share the same physical

medium, and there is no need for addressing or routing at the network layer to direct

packets to specific destinations. Since all stations can receive transmissions from any

other station, there is no need for network layer protocols like IP (Internet Protocol) to

determine routes or addresses for packet delivery.

2. Broadcast and Multicast: Broadcast networks inherently support broadcast and

multicast communication, where a single transmission can reach multiple destinations

simultaneously without the need for network layer protocols to manage multicast groups

or address resolution.

Question 4

What key factors affect channel capacity?

Channel capacity, also known as channel bandwidth, refers to the maximum data rate or capacity

at which information can be reliably transmitted over a communication channel. Several key

factors affect channel capacity:

1. Bandwidth: The bandwidth of the channel refers to the range of frequencies or the

amount of spectrum available for transmission. Generally, a wider bandwidth allows for

higher data rates. The Shannon-Hartley theorem states that channel capacity is

proportional to the bandwidth of the channel.

2. Signal-to-Noise Ratio (SNR): The signal-to-noise ratio measures the ratio of the power

of the signal to the power of the noise present in the channel. A higher SNR indicates less

interference and better signal quality, allowing for higher data rates. The Shannon-Hartley

theorem also considers SNR as a factor affecting channel capacity.

3. Channel Distortion: Distortion in the channel, such as attenuation, dispersion, and

distortion caused by reflections and multipath propagation, can affect the quality of the

transmitted signal. Severe distortion can limit the achievable data rates.

4. Modulation Scheme: The modulation scheme used to encode data onto the carrier signal

also affects channel capacity. Different modulation schemes have different spectral

efficiencies and data rates. For example, more complex modulation schemes like

quadrature amplitude modulation (QAM) can achieve higher data rates compared to

simpler schemes like amplitude modulation (AM) or frequency modulation (FM).