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Ans. to the ques. no - 1

In data communication system, protocols are ensuring that informations are shared accurately and efficiently between connected devices. A protocol is essentially a set of rules that defines how data is transmitted. The basic elements of a protocol are syntax, symantics and timing.

Syntax:

Syntax refers to the structure of the transmitted data, which includes the layout of bits and the rules for encapsulating data. In terms of syntax, the protocal defines how the information is formatted into packets or frames.

Example: Payload, Checksum, Http Headers.

Semantics:

Semantics deals with the meaning of each section of data, interpreting what each piece of information signifies. It defines everything about data includes errors handling, flow control and response actions. It ensures that each part of the transmitted data can be understood correctly by both senders and receivers.

Example: TCP

Timing :

Timing refers to the co-ordination between senders and receivers to ensure data is sent at the correct speed. It ensures that receiver can process the data being sent and that both parties are synchronized. Timing also includes clock synchronization between devices.

Ans. to the ques: no-2

When computers X sends a message to computer Y via ~~for~~ LAN network the data transmission unit for each layer of TCP/IP model are:

Application layer (Data):

The data at the Application layer consists of the information generated by the application software. This layer deals with user level data such as HTTP requests, email content or file transfer data. At this stage, the data is referred to as just data.

Transport layer (Segment):

The transport layer is responsible for turning reliable data into smaller chunks called segments or data grams. These segments contain the necessary information for reliable transmission such as sequence numbers and acknowledgements.

Network layer (Packet):

The network layer is responsible for routing the data between devices accross different networks. At the layer, the segments are encapsulated into packets, which contain the source and destination IP address used for determing the route of the data accross the network.

Data link layer (Frame):

The data link layer is responsible for delivering data to the correct physical device on a network. At this layer, the packets from the Network layer are encapsulated into frames.

Physical layer (Bits):

The physical layer is responsible for the actual transmission of raw bits over the physical medium. At this layer, frames are converted in to a stream of bits.

Thus, data moves through the TCP/IP layers as,

data → segment → packet → frame → bits

Ans. to the ques. no - 3

(a)

The bit rate is $= 48 \times 90 \times 8 \times 200$ bit/min

$$= \frac{6912000}{60} \text{ bit / sec}$$

$$= 115200 \text{ bps}$$

$$= 115.2 \text{ kbps}$$

(Ans)

(b)

given,

power of a signal, 30mW

power of the noise, $3\mu W$

$$\therefore SNR = \frac{30 mW}{3 \mu W}$$

$$= \frac{30000 \mu w}{3 \mu w}$$

$$= 10000$$

$$\therefore SNR_{dB} = 10 \log_{10} SNR$$

$$= 10 \log_{10} 10000$$

$$= 40 dB$$

(Ans)

Ans. to the ques. no-9

(i)

we know,

$$S = N \times \frac{1}{r}$$

$$\Rightarrow r = \frac{N}{S}$$

$$= \frac{5000}{500}$$

$$= 10 \text{ bits / baud}$$

given,

$S = 500$ baud

$N = 5000$ bps

$\therefore$ So, amount of data element carried by each signal element is 10 bits/baud.

(ii)

From (i) we get, $r = 10$ bits/baud

we know, $r = \log_2 L$

$$\Rightarrow L = 2^r$$

$$\Rightarrow L = 2^{10}$$

$$\therefore L = 1024$$

$\therefore$ So, we need 1024 signal element.

Ans. to the ques no - 5

When a analog signal is transmitted through a medium like copper wire, it can face several types of transmission impairments which degrades the quality of the signal. The common impairment are attenuation, noise, distortion, delay, interference etc.

Attenuation: Attenuation refers to the loss of signal strength as it travels over a distance. In copper wires, as the signal travels it gradually loses energy, requiring amplification at certain intervals. The further the signal travels the more it attenuates, potentially leading to a weak or unreadable signal at receiver's end.

Noise: Noise is any unwanted interference that distorts the signal. Several types of noise can occure. such as;

- Thermal noise: Caused by the random movement of electrons in the wire due to temperature.
- Crosstalk: Interference from adjacent wires in the cable.
- Impulse noise: Sudden bursts of noise caused by external factors, such as electrical spikes.

Distortion:

Distortion occurs when different frequency components of a signal travel at different speeds, causing the shape of the signal to change over time. This can result in errors when interpreting the signal at the receiver end.

Delay:

Delay distortion occurs when signals of different velocities through the medium. It determines when signals of different frequencies travel at different velocities through the medium.

Each of these impairments can degrade the quality of the transmitted signal from sender P to receiver Q.