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Question # 01:

Briefly describe the services provided by the data link layer.

ANSWER # 01:-

It specifies the structure of the frame as well as a channel access protocol by which frame is to be transmitted over the link. **Reliable delivery:** Data Link Layer provides a reliable delivery service i.e. transmits the network layer datagram without any error.

Question # 2.

Compare and contrast byte-oriented and bit-oriented protocols.

ANSWER # 2.

Byte-oriented protocol:

In this field upto 8 bits is allocated 1 byte. Fields upto 8-16 bits is given double byte. These are typically used in softwares as it is easy to process them. This will be loose packing of data

Compare to bit-oriented protocol.

BIT-oriented Protocol:-

In this any field can be an arbitrary number of bits long. So if the field only needs for possible values, it can be only 6 bits long. They are typically used in hardware where bandwidth is an important consideration. This will allow tighter packing of data.

Question:-

Byte-stuffing and bit stuffing:-

ANSWER:-

Byte-stuffing:- Byte-stuffing is the process of adding 1 extra byte whenever there is flag or escape character in the text.

Bit-stuffing:- Bit-stuffing is the process of adding one ~~or~~ extra 0 whenever five consecutive 1s follow a 0 in the data, so the receiver does not mistake the pattern 011110 for a flag.

Question

Flow control and error control.

ANSWER:

In data communications, flow control is the process of managing the rate of data transmission b/w two nodes to prevent a fast sender from overwhelming a slow receiver.

Flow control should be distinguished from congestion control, which is used for controlling the flow of data when congestion has actually occurred.

ERROR CONTROL:

The error control observe that the data delivered to the receiver is error free and reliable.

Question

HDLc and PPP.

ANSWER :-

The major difference b/w HDLC and PPP is that HDLC is the bit-oriented-protocol while PPP is the character-oriented protocol. On the other hand, the PPP protocol deals with

The encapsulation of the data transported in the point-to-point links and it could be synchronous or asynchronous.

Question

Go-back-N ARQ protocol and Selective-Repeat-ARQ-Protocol.

ANSWER:

The main difference b/w these two protocols is that after finding the suspect or damage in sent frames Go-back-n protocol re-transmits all the frames whereas selective repeat protocol re-transmits only that frame which is damaged.

Question:-

Circuit-switched network and a packet-switched network.

ANSWER:-

Circuit-switched is connection oriented that means a path is established b/w source and destination before the transmission occurs.

on the other hand, packet switching is connectionless that means a dynamic route is decided for each packet while transmission.

Question

Space-division and time-division switches :-

ANSWER:

In a " space-division switch, the path from one device to another is spatially separate from other paths. The inputs and the outputs are connected using a grid of electro-microswitches. In a time-division switch, the inputs are divided in time using TDM. A control unit sends the input to the correct output device.

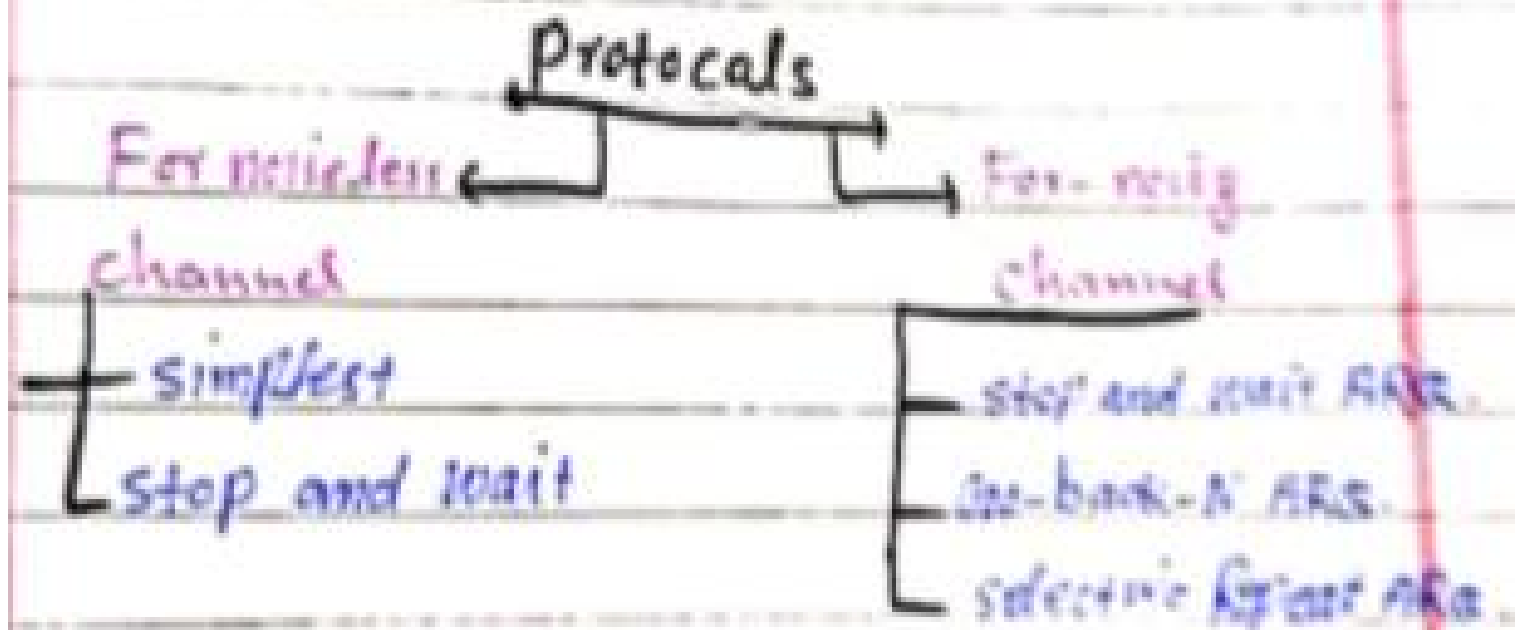
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QUESTION # 3.

Explain the protocol for noise and noisy channel.

ANSWER # 3.

HDLC and HDLC channel
 frame size is the sender sends
 a sequence of frames without
 even thinking about the receiver.
 Note that the data frames are
 shown by tilted boxes. The height
 of the box defines the transmission
 time difference b/w the first bit
 and the last bit in the frame.



Question 4

EXPLAIN piggybacking in HDLC.

The receiver waits until its network layer passes in the next data packet. The delayed acknowledgment is then attached to this outgoing data frame. This technique

of temporarily delaying the acknowledgement so that it can be hooked with next outgoing data frame is known as piggybacking.

Question # 5

Explain blocking in a switched:-

ANSWER: # 5

In multistage switching blocking refers to times when one input cannot be connected to an output because there is no path available b/w them all the possible intermediate switches are occupied. one solution to blocking is to increase the number of intermediate switches based on the close criteria.

Question # 6

Two neighboring nodes (A and B) use a sliding-window protocol with a 3-bit sequence number. As the ARQ mechanism, go-back-N is used with a window size of 4. Assuming A is transmitting and B is receiving, show the window position for the following succession:

of events.

① Before A sends any frames

② After A sends frames 0, 1, 2 and receives acknowledgment from B for 0 and 1.

③ After A sends frames 3, 4 and 5 and B acknowledges 4 and the ACK is received by A.

Answer # 6.

@ Before A sends any frames.

Sender :

0	1	2	3	4	5	6
---	---	---	---	---	---	---

Window of PDU that may be transmitted = 4-bit window.

Receiver :

0	1	2	3	4	5	6
---	---	---	---	---	---	---

b) After A sends frames 0, 1, 2 and receives acknowledgement from B for 0 and 1.

A has shrunk its window as it has transmitted three PDUs but has received ack for 2 PDUs. Hence it is keeping copy of one PDU.

Sender :

0	1	2	3	4	5	6
---	---	---	---	---	---	---

Acknowledgment received for two bits.

Receiver:



Receiver has received all data hence the window remains in k -bit size.

③ After A sends frames 3, 4 and 5 and B acknowledges k -bit and the ACK for 11 is received by A.

Sender:



Question # 7

List three techniques of digital-to-digital conversion.

Digital-to-digital conversion:

Three techniques of digital-to-digital conversion: line coding, block coding and scrambling.

Line coding is always needed.

Block coding and scrambling may

Question # 11

What is the number of bits in an IPv4 address? What is the number of bits in an IPv6 address?

Answer # 11.

An IPv4 address is 32 bits long.

An IPv6 address is 128 bits long. IPv4 uses 32-bit (four-byte) addresses, which limits the address space to 4294967296

Question # 12

What are the difference b/w classful addressing and classless addressing in IPv4?

Classful addressing assigns an organization a class A, class B or class C block of addresses. Classless addressing assigns an organization a block of contiguous addresses based on its needs... classless addressing use a variable number of bit for the network and host portions of the address.

Question # 13.

List the classes in classful and define

Question # 14.

Answer # 14.

An IP address has two components. The network address and the host address... A subnet mask is a 32-bit number that masks an IP address, and divides the IP address into network address and host address.

Subnet mask is made by setting network bits to all "1"s and setting host bits to all "0"s.

The default subnet mask for class A IP address is 255.0.0.0 which implies that class A addressing can have 126

networks ($2^7 - 2$) and (6777214 hosts
($2^{24} - 2$).

Question # 15.

ANSWER # 15.

The network address is the first address. The network address defines the network to the rest of the internet. In classful addressing, the network address (the first address in the block) is the one that is assigned to the organization. Given the network address 17.0.

Question # 16

ANSWER # 16.

A NAT (Network Address Translation or Network Address Translator) is the virtualization of internet Protocol (IP) addresses. NAT helps improve security and decrease the # of IP addresses an organization needs. NAT gate ways sit b/w two networks, the inside network and the outside network.

Question # 17.

ANSWER # 17.

one address addresses one byte.

Using 16 bits, you can write
 65536 addresses (from 0 to 65536 ,
 that is 65536 different addresses),
 and address 65536 bytes. 65536 bytes
 is 64KB . In computer science b is bit,
 B is byte.

Question # 18

Answer # 18

Addressing within a 1024 -word page
 required 10 bits because $1024 = 2^{10}$.
 Since the logical address space consists
 of $8 = 2^3$ pages, the logical addresses
 must be $10 + 3 = 13$ bits. Similarly,
 since there are $32 = 2^5$ physical
 pages, physical addresses are $5 + 10 =$
 15 bits long.

Question # 19

change the following IP addresses
 from dotted-decimal notation to
 binary notation.

a) $129.14.6.8$.

b) $208.34.54.12$.

Answer # 19

a) $129.14.6.8$

$$129 = 1000001$$

$$14 = 1110$$

$$6 = 110$$

$$8 = 1000$$

Hence

$$129 \cdot 14 \cdot 6 \cdot 8$$

$$1000001 \cdot 1110 \cdot 110 \cdot 1000$$

$$b) 208 \cdot 34 \cdot 54 \cdot 12$$

$$208 = 11010000$$

$$34 = 100010$$

$$54 = 110110$$

$$12 = 1100$$

Hence,

$$208 \cdot 34 \cdot 54 \cdot 12$$

$$11010000 \cdot 100010 \cdot 110110 \cdot 1100$$

Question # 20

Answer # 20

$$a) 01111111 \cdot 11100000 \cdot 01100111 \cdot 0111101$$

$$b) 10101111 \cdot 11000000 \cdot 11110000 \cdot 0011101$$

$$a) 125 \cdot 240 \cdot 108 \cdot 125$$

$$b) 175 \cdot 192 \cdot 248 \cdot 29$$

Question # 21.

ANSWER # 21.

In a block of addresses, we know the IP address of the host is 25.34.12.56/16 one host, first address 189.

44. 89.1 Network address 189.44.

1) In a block of addresses we know the IP address of the host is

25.34.12.56/16, one host, first addresses 25.34.0.1 Network address 25.34.00.

Last address: 25.34.255.255.

Limited address 25.34.255.255.

in block.

) one host, first address 189.44.89

Network address 189.44.89.0 Last address: 189.44.89.255 Limited address

or may not be needed. Line coding

Line coding:

Line coding is the process of converting digital data to digital signals.

Line coding converts a sequence of bits to a digital signal.

At the sender, digital data are encoded into a digital signal.

Question # 8

Distinguish b/w a signal element and a data element:

ANSWER # 8

A data element is the smallest entity that can represent a piece of information (a bit). A signal element is the shortest unit of a digital signal. Data elements are what we need to send, signal elements are what we can send. Data elements are being carried; signal elements are the carriers.

Question # 9

Distinguish b/w data rate and signal rate: