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Question Number 1

In the OSI Model, each layer uses the services of the layer below it and provides service to the above layer. The Primary function of the data link layer is to provide a well defined service interface to the network layer above it.

Types of Services:-

The data link layer offers three types of services.

★ Unacknowledged connectionless services:-

The data link layer of the sending machine sends independent frames to the data link layer of the receiving machine. The receiving machine does not acknowledge receiving the frame. No logical connection is set up between the host machines. Error and data loss is not handled in this service. This is applicable in Ethernet services and voice communication.

★ Acknowledged connectionless service:-

No logical connection is set up between the host machine, but each frame sent by the source machine is

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acknowledged by the destination machine on receiving. If the source does not receive the acknowledgment within a stipualated time then it resends the frame. This is used in wifi services.

★ Acknowledged connection-oriented services:

This is the best service that the data link layer can offer to the network layer. A logical connection is set up between the two machines and the data is transmitted along this logical path.

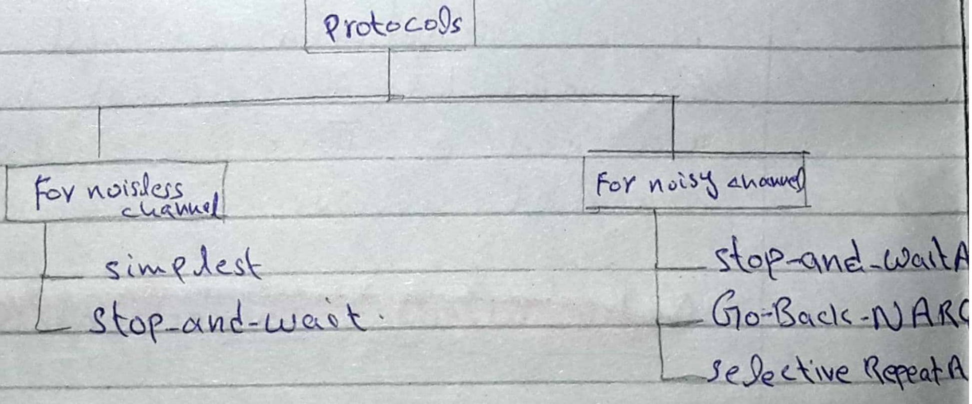
The service has three distinct phases.

=> set up of connection.

=> Sending frames.

=> Release connection.

Question No = 3:-



Page #3:-

Noisy Channels:-

Although the stop-and-wait Protocol gives us an idea of how to add flow control to it's predecssor, noiseless channels are nonexistent. We disuss three protocols in this section that use error control.

Stop-and-Wait automatic Repeat Request
Go-Back-N automatic Repeat Request
Selective Repeat alltomatic Repeat Reqhest.

Noiseless Channel:-

An ideal channel in which no frames are lost, duplicated or corrupted is regarded as noiseless channel.

Simplest Protocol:-

In simplest Protocol, there is no flow control and error control mechanism. It is a unidirectional protocol in which data frames travel in only one direction. Also the recever can immediately handle any received frame with a processing time that is small enough to be negligible.

Question No 4:.

Communications are mostly full-duplex in nature, i.e data transmission occurs in both directions. A method to achieve full-duplex communication is to consider both the communication as a pair of simplex communication. Each link comprises a forward channel for sending data and a reverse channel for sending acknowledgments.

However, in the above arrangement, traffic load doubles for each data unit that is transmitted. Half of all data transmission of acknowledgments.

So, a solution that provides better utillization of bandwidth is piggybacking.

Question #5:-

In multistage switching, blocking refers to times when one input cannot be connected to an output because there is no path available between them - all the posible intermediate switches are occupie One solution to blocking is to increase the number of intermediede switches based on the clos criteria.

Question #7:-

There techniques of digital to digital conversion- Line coding, Block coding, and scrambling.
Line coding is always needed, Block coding and scrambling may or may not be needed-

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; at the receiver; the digital data are recreated by decoding the digital signal.

Question No 8

Signal Element versus Data Element:-

Question = 8

=> In data communications, our goal is to send data elements.
=> A data elements is the smallest entity that can represent a piece of information this is the bit.
=> In digital data communication, a signal element carries data elements.
=> A signal elements is the shortest unit of a digital signal.
=> Data Element are being carried; Signal elements are the carriers.

Data Rate:-

The Data rate defines the number of data elements (bits) sent in 1s. The unit is bits per second (bps)

Signal Rate:-

The signal rate is the number of signal elements sent in 1s. The unit is The ~~baud~~ Pulse rate / modulation rate or simply baud.

Question No = 11

The IPV4 addresses we are all used to seeing are made up of four numerical octets that combine to form a 32-bit address. IPV6 addresses look nothing like IPV4 addresses. IPv6 addresses are 128 bits in length and are made up of hexadecimal characters.
In IPV4, each octet consists of a decimal numbers ranging from 0 to 255. These numbers are typically separted by periods. In IPV6, addresses are expressed as a series of eight-4-character hexadecimal numbers, which represent 16 bits each (for a total of 128 bits)

Question No = 12

Classless addressing and classful addressing refer to two different ways to think about IP addresses. Both ~~re~~ terms refers to a perpective on the structure of a subnetted IP Address. Classless addressing ~~using~~ uses a two-part view of IP addresses, and classful addressing, has a three-part view. With classful addressing, the address always has an 8-, 16- or 24-bit network field, based on the class A, B and C addressing rules. The end of the address has a host part that uniquely identifies each host inside a subnet. The bits in between the networks and host part comprise the third part, namely the subnet part of the address. With classless addressing, the network and subnet parts from the classful view are combined into a single part often called the subnet or prefix, with the address ending in the host part.

Question = 13

The 32-bit IP Address is divded into five sub-classes. These are

* Class A
* Class B
* Class C
* Class D
* Class E

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Each of these classes has a valid range of IP addresses.

=> Classes A, B and C are used for unicast communication.

=> Class D is for multicast communication.

=> Class E addresses are reserved for special Purposes.

Question No:-14:-

An IP Address has two componets, the network address and the host address. A subnet mask separates the IP address into the network and host addresses ~~(the networ~~ subnetting further divides the host part of an IP address into a subnet and host address. If additional subnetwork is needed. Use the the subnet calculator to retrieve subnetwork information from IP address and subnet Mask. It is called a subnet mask because it is used to identify network address of an IP address by perfming a bitwise And operation on the ~~m~~ netmask.

A subnet mask is a 32-bit number that makes 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. Within a given network, two host addresses are reserved for special purpose, and cannot ba assigned to hosts. The "0" address is assigned

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a network address and "255" is assigned to a broadcast address, and they cannot be assigned to hosts.

Question #15

An address in slash notation (CIDR) contains all information we need about the block: the first address (network address) the number of addresses, and the last address.

These pieces of information can be found as following.

The number of addresses in the block can be found as: $N = 2^{32-n}$ in which n is the prefix length and N is the number of addresses in the block.

The first address (network address) in the block can be found by ANDing the address with the network mask.

If one of the addresses is: 167.199.170.82/27 then;

=> The prefix length is 27

we must keep the first 27 bits as it is and change the remaining bits (5) to 0s.

=> The 5 bits affect only the last byte

=> The Last byte is 01010010

=> changing the Last 5 bits to 0s, we get 01000000 or 64.

=> The network address is 167.199.170.64/27

Question #16

NAT:>

NAT stands for network address translation. It's a way to map multiple local private addresses to a public one before tranferring the information. Organizations that want multiple devices to employ a single IP address use NAT, as do most home routers.

How can NAT Help:>

Theoretically, there are 2^32 IPV4 addresses, a little more than 4 billion IPV4 addresses. The number of IPV4 available addresses is actually less than the theoretical number, since some of the addresses in a network are reserved for broadcasting, multicasting or other special purposes, they cannot be assigned to hosts.

With the explosion of devices online, the available IPV4 addresses are just not enough. NAT was designed as a temporary solution to circumvent this problem and support IPV4 addresses reusability. NAT resulted in IPV4 addresses being divided into two broad categories; Public and Private. The range of private IPV4 addresses can be used by anyone and are unregistered, which means that they cannot be recogined outside the network in they are assigned.

Question #~~18~~ 19

129.14.6.8

129

2	129
2	64 reminder = 1
2	32 reminder = 0
2	16 reminder = 0
2	8 reminder = 0
2	4 reminder = 0
2	2 reminder = 0
2	1 reminder = 0

0 (reminder = 1)

129 (in decimal) = 10000001 (in binary)

14

		Reminder
2	14	
2	7	= 0
2	3	= 1
2	1	= 1

0 (reminder = 1)

14 (in decimal) = 00001110

6

		Reminder
2	6	
2	3	= 0
2	1	= 1

0 (reminder = 1)

6 (in decimal) = 00000110 (in binary)

8:-

		Reminder
2	8	
2	4	= 0
2	2	= 0
2	1	= 0

0 (reminder = 1)

8 (in decimal) = 00001000

So in binary conversion, the IP address 129.14.6.8 becomes

10000001.00001110.00000110.00001000

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208.34.54.12

208:

		Reminder:
2	208	
2	104	= 0
2	52	= 0
2	26	= 0
2	13	= 0
2	6	= 1
2	3	= 0
2	1	= 1

0 (reminder = 1)

208 (in decimal) = 11010000 (in binary)

34

		Reminder:
2	34	
2	17	= 0
2	8	= 1
2	4	= 0
2	2	= 0
2	1	= 0

0 (reminder: 1)

34 (in decimal) = 00100010

54

		Reminder:
2	54	
2	27	= 0
2	13	= 1
2	6	= 1
2	3	= 0
2	1	= 1

0 (reminder = 1)

54 (in decimal) = 00110110 (in binary)

12

		Reminder:
2	12	
2	6	= 0
2	3	= 0
2	1	= 1

0 (reminder = 1)

12 (in decimal) = 00001100

So in binary conversion, The IP Address 208.34.54.12 becomes 11010000.00100010.00110110.00001100.

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Question #20

A: 01111111 11110000 01100111 01111101:-

Ans:-
(127.240.103.125)

b:-> 10101111 11000000 11111000 00011101

Ans: (175.192.248.29)