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Assignment 1

1 Match the following to one or more layer of OSI model.

a. Establishes, manages and terminates sessions
→ Session layer

b. Provides user services such as email & file transfer
→ Application layer

c Formate & code Conversion services
→ Presentation layer

d Route selection
→ Network layer

2. If the data link layer can detect errors between hops, why do you think we need another checking mechanism at the transport layer

→ The errors between the nodes can be detected by the data link layer, but the errors at the node (b/w input port and output port) of the node cannot be detected by the data link layer. That's why we need another checking mechanism at the transport layer
- Also the data link layer is not fully accurate that means it is not that data link layer will detect all the errors.

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3 What advantages does a circuit switched? and network have over a packet-switched network?

→ Circuit switching network are well suitable for real time services such as voice calls and video calls whereas packet-switched network are not suitable for real time services. They are suitable for handling data

- In circuit-switched networks, the transmission link is pre-allocated without taking into consideration the demand whereas packet switched network allocates transmission link on demand.

- In circuit-switched network, the bandwidth is reserved & so packets arrive within the bandwidth whereas in packet switched network, the bandwidth is not reserved and so the packets may have to wait for their turn to be forwarded

4 Five equal size datagram belongs to the same message leave for the destination one after another. However, they travel through different paths as shown in table below.

Datagram	Path Length	Visited Switches
1	3500 km	1, 3, 5
2	12000 km	1, 2, 5
3	13500 km	1, 2, 3, 5
4	10000 km	1, 4, 5
5	9500 km	1, 4, 3, 5

We assume that the delay for each switch [including waiting and processing] is 2, 8, 20, 7 and 18 ms respectively. Assuming that the propagation speed is 2×10^8 m, find the order the datagram arrives at the destination and delay for each. Ignore any other delay in transmission.

→ Assume that the transmission time is negligible suppose all datagrams starts at time 0, there delay for switch

1 - 2
2 - 8
3 - 20
4 - 7
5 - 18

∴ Delay for datagram 1 = $\frac{3500}{2 \times 10^8}$ [2 + 20 + 18]

= 0.7 ms

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datagram 2 = $\frac{11000}{2 \times 10^8}$ [2 + 8 + 8]

= 1.54 ms

datagram 3 = $\frac{13500}{2 \times 10^8}$ [2 + 8 + 20 + 28]

= 3.24 ms

datagram 4 = $\frac{10000}{2 \times 10^8}$ [2 + 7 + 28]

= 1.35 ms

datagram 5 = $\frac{9500}{2 \times 10^8}$ [2 + 7 + 20 + 28]

= 2.23 ms

∴ Order of datagram arrival is 1, 4, 2, 5, 3

5 Given the data word 1101011111 & the divisor 10011

a) show the generation of the codeword at sender side

b) show the generation of the dataword at receiver side

a. data word : 1101011111

divisor : 10011

l = s

∴ Augmented dataword : 1101011111 0000

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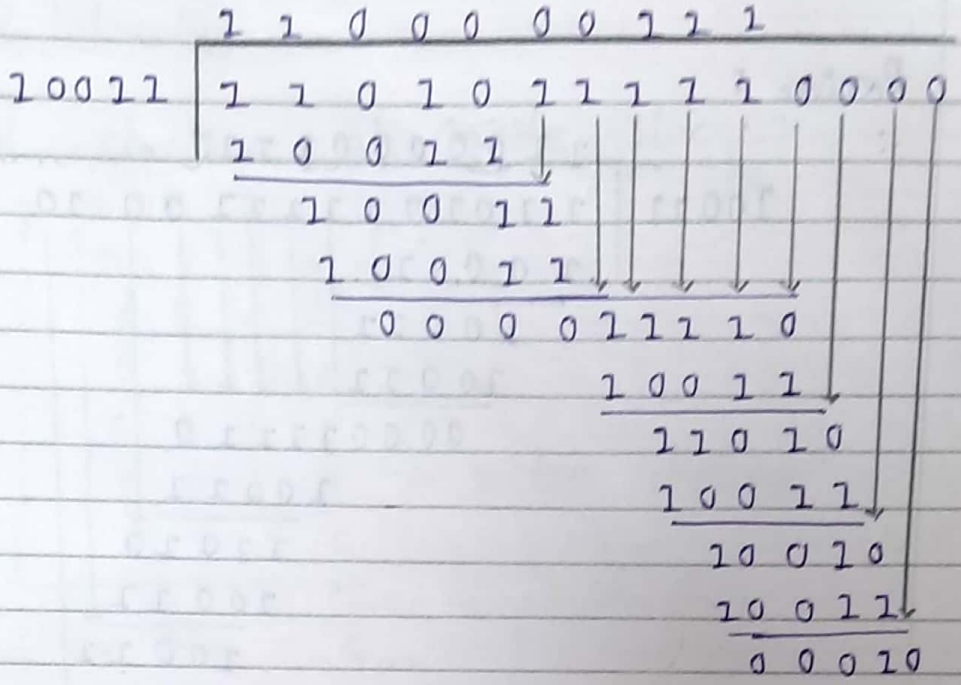
Sender :



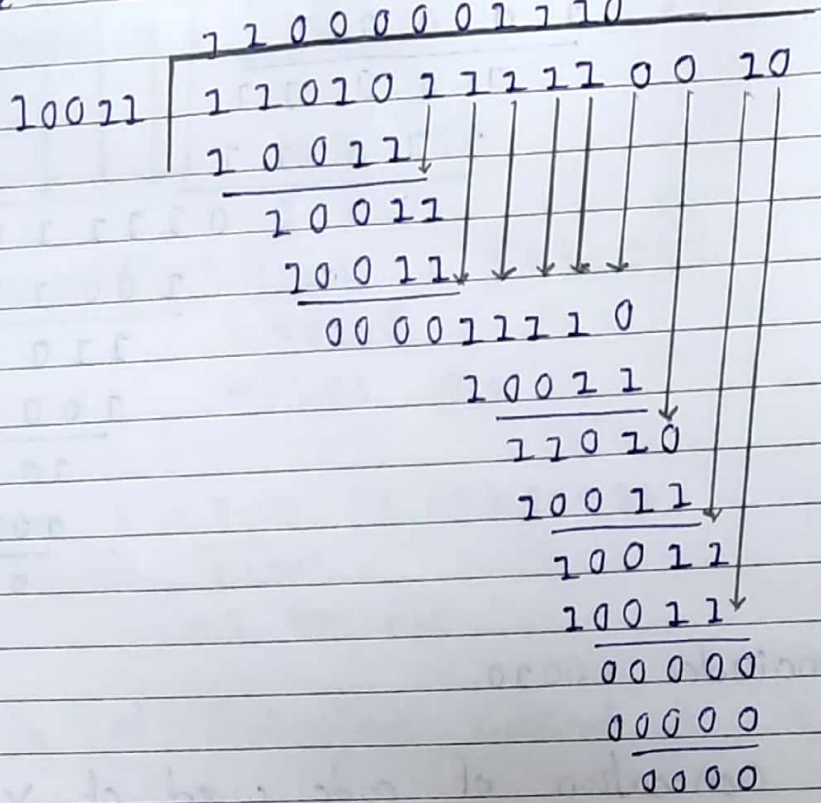
Remainder : 0010

∴ Generation of code word at sender side is

11010111100010

b. Assuming no errors data is sent from sender side

Receiver :



Here at receiver side remainder is all 0's it means that there is no error in data.

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6. A sender needs to send four data items 0x3456, 0xABCC, 0x02BC, & 0xEEEE. Answer the following

a. Find checksum at sender side

1	2	2	2	
	3	4	5	6
	A	B	C	C
	0	2	B	C
	E	E	E	E
	0	0	0	0	← initial checksum
	D	1	C	C
				→ 1

Sum ⇒ D 1 C D

Now, checksum = (sum)'
∴ checksum = 2E32

b. Find the checksum at receiver side if there is no error

Adding checksum with given data

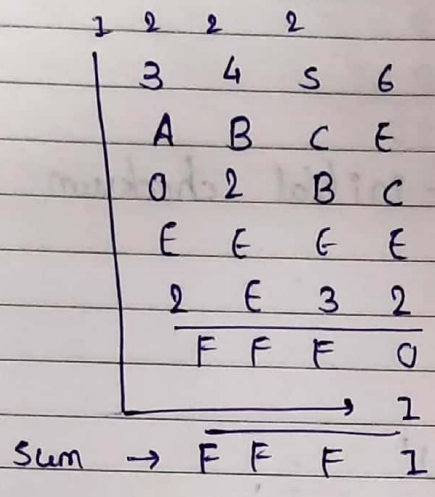
1	2	2	2	
	3	4	5	6
	A	B	C	C
	0	2	B	C
	E	E	E	E
	2	E	3	2
	F	F	F	E
				→ 1

Sum ⇒ F F F F

Now checksum = (sum)'
= 0000

Here we Assumed that there is no error in data so check sum at receiver is 0000

c. Find checksum at receiver side if the second data item is changed to 0x ABCE



checksum = (sum)'
= 000E

Here the checksum is not 0000 so we can say that there is an error in dataframe 2