CT Assignment -2

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Answer to the Question no-1

a) List three techniques of digital-to-digital conversion.

Solution: The three different techniques describe in this digital-to-digital conversion are line coding, block coding and scrambling.

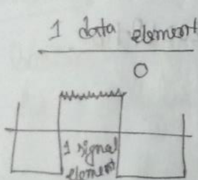
b) Compare and Contrast PCM and DM.

Solution: Both PCM and DM use sampling to convert an analog signal to a digital signa

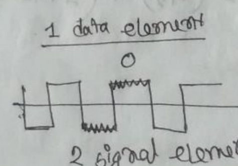
PCM finds the value of the signal amplitude for each sample; DM finds the change between two consecutive samples.

(c) Calculate the value of the signal rate for each case in figure-A. If the data rate is 1Mbps and $c = 1/2$

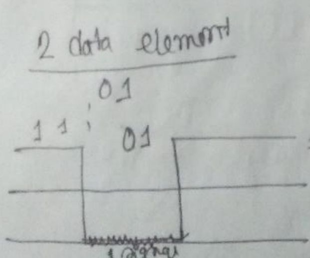
Figure-A



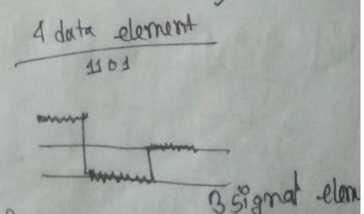
a. One data element per one signal element ($r=1$)



b. One data element per two signal element ($r = \frac{1}{2}$)



two data element per one signal eleme ($r=2$)



d. four data elements per three signal element ($r = 4/3$)

Solution

We use formula $S = c \times N \times (1/r)$ for each case. We let $c = 1/2$.

a) $r = 1 \rightarrow S = (1/2) \times (1 \text{ Mbps}) \times 1/1 = 500$ kbaud

b) $r = 1/2 \rightarrow S = (1/2) \times (1 \text{ Mbps}) \times 1/(1/2) = 1$ Mbaud.

c) $r = 2 \rightarrow S = (1/2) \times (1 \text{ Mbps}) \times 1/2 = 250$ kbaud

d) $r = 4/3 \rightarrow S = (1/2) \times (1 \text{ Mbps}) \times 1/(4/3) = 200$ bits.

d) Draw the graph of the NRZ-L scheme using each of the following data streams, assuming that the last signal level has been positive. From the graph, guess the bandwidth for this scheme using the average number of changes in the signal level. Compare your guess with the corresp.

a. 00000000
b. 11111111

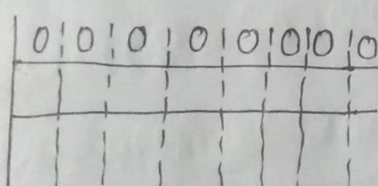
c. 01010101
d. 00110011

Solution:

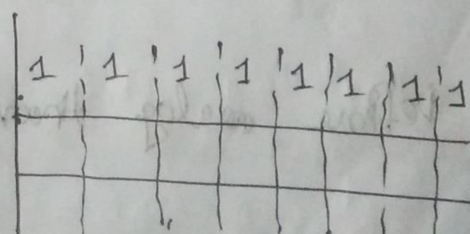
Bandwith is proportional to (3/8 N) which is within the range in (B = 0 to N) for the NRZ-L sche

Average number of change = (0+0+8+4)/4 = 3 fo
N = 8

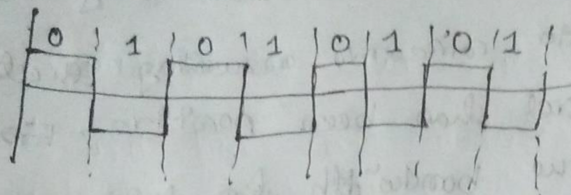
B → (3/8) N



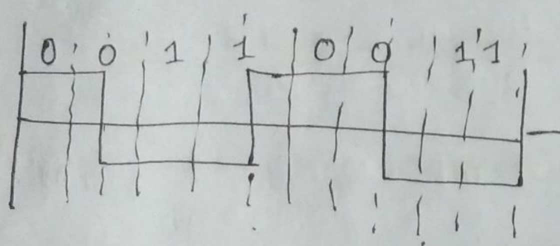
Case – a



Case – b



Case - C



Case - D

Answer to the Question no-2

Q1. Define analog transmission?

Solution: Normally, analog transmission refers the transmission of analog signals using a 6 band-pass channel. Baseband digital or analog signal are converted to a complex analog signal with a range of frequencies suitable for the channel.

b) which characteristics of an analog signal are change to represent the digital signal in each of the following digital-to-analog conversions?

a. ASK
b. FSK
c. PSK
d. QAM

Solution 8

a) ASK changes the amplitude of the carrier.
b) FSK changes the frequency of the carrier.
c) PSK changes the phase of the phase of the carrier
d) QAM changes the amplitude and phase of the carrier

(1) Calculate the baud rate for the given bit rate and type of modulation.

1. 2000 bPS, FSK
2. 40000 bPS, ASK
3. 6000 bPS, QPSK.
4. 36000 bPS, 64 - QAM.

Solutions

We use the formula $S = (1/r) \times N$, but first we need to Calculate the value of r for each Case.

1) $r = \log_2 2 = 1 \rightarrow S = (1/1) \times (2000 \text{ bPS}) = 2000$ baud

2) $r = \log_2 2 = 1 \rightarrow S = (1/1) \times (4000 \text{ bPS}) = 4000$ baud

3) $r = \log_2 4 = 2 \rightarrow S = (1/2) \times (6000 \text{ bPS}) = 3000$ baud

4) $r = \log_2 64 = 6 \rightarrow S = (1/2) \times (36000 \text{ bPS}) = 6000$ bau

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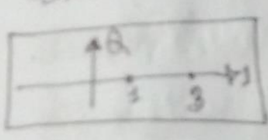
d) Draw the constellation diagram for the following:

1) ASK with peak amplitude values of 1 and 3
2) BPSK with a peak amplitude values of 2
3) QPSK with a peak amplitude values of 3.

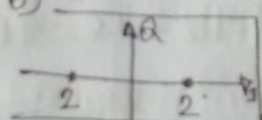
Solution:

See figure-(i)

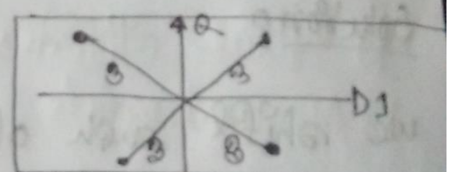
a) ASK



b) BPSK



c) QPSK



Answer the Question no-3

a) Assume that a voice channel occupies a bandwidth of 4KHz. we need to combine three voice channels into a link with a bandwidth of 12 KHz, from 20 to 32 KHz. Show the configuration using the frequency domain. Assume ~~three~~ there are no guard bands.

Solution:

we shift each of the three voice channels to a different bandwidth, as ~~so~~ shown. we use the 20 to 24 KHz bandwidth for the first channel, the 24 to 28 KHz bandwidth for the second channel, and the 28 to 32 KHz bandwidth for the third one. each channel receive the entire signal, using a filter to separate out its own signal. Each channel then shifts the frequency to start from 2000.

b) Describe the goals of multiplexing.

Solution:

Multiplexing is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link.

c) Distinguish between a link and a channel in multiplexing.

Solution: In multiplexing, the word

link refers to the physical path. The word Channel refers to the protion of a link that carries a transmission between a given pairs of lines. One link can have many Channels.

c) Assume that a voice Channel occupies a bandwidth of 4KHz. we need to multiplex 10 voice channels with guard of 500Hz using FDM. Calculate the required bandwidth.

Solution:

The multiplexing 10 voice channels, we need nine guard bands. The require bandwidth is then $B = (4KHz) \times 10 + (500Hz) \times 9 =$ 44.5 KHz.

d) which of the three multiplexing techniques are used to combine analog signals?

which of the three multiplexing techniques are used to combine ~~analog~~ digital signals.

Solution:

FDM and WDM are used to combine analog signals, the bandwidth is shared.

TDM is used to combine digital signals; the time is shared.

Answer to the Question no-4

a) What is the position of the transmission media in the OSI or the Internet model.

Solutions

The transmission media is located beneath the physical layer and controlled by the physical layer.

b) Name the two major categories of transmission media.

Solutions

The two major categories are guided and ~~ung~~ unguided

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c) calculate the bandwidth of the light for the following wavelength ranges (assume a prog propagation speed of 2×10^8 m):

a. 1000 to 1200 nm.
b. 1000 to 1400 nm.

Solution:

we can use the formula $f = c/\lambda$ to find the corresponding frequency for each wave length as shown below:

a) $B = [(2 \times 10^8)/(1000 \times 10^{-9})] - [(2 \times 10^8)/(1200 \times 10^{-9})]$
33 THz.

b) $B = [(2 \times 10^8)/(1000 \times 10^{-9})] - [(2 \times 10^8)/(1400 \times 10^{-9})] =$
57 THz

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d) Using figure-1 tabulate the attenuation (in dB) of a 2.6/9.5 mm coaxial cable for the indicated frequencies and distances:

Attenuation for 2.6/9.5 mm coaxial cable.

Distance	dB at 1KHz	dB at 10KHz	dB at 1000KHz
1km	-		
10Km			
15km			
20km			

Solution:

Distance	dB at 1 KHz	dB at 10KHz	dB at 1000KHz
1km	-3	-7	-20
10km	-30	-70	-200
15km	-45	-105	-300
20km	-60	-140	-400

Answer to the Question no-5

a) Describe the need for switching and define a switch?

Solutions

Switching provides a practical solution to the problem of connecting multiple devices in a network. It is more practical than using a bus topology. It is more efficient than using star topology and a central hub. Switches are devices capable of creating temporary connections between two or more devices linked to the switch.

b) List the three traditional switching method. What are the most common today?

Solutions

The three traditional switching methods are circuit switching, packet switching and message switching. The most common today are circuit switching and packet switching.

c) Consider an n×k crossbar switch with n input and k output

a) Can we say that switch acts as a multiplexer if n>k?

b) Can we say that switch acts as demultiplexer if n<k?

Solutions

a) If $m > k$ and $m \times k$ a crossbar is like a multiplexer that combines m inputs into k outputs. However, we need to know that a regular multiplexer is $m \times 1$.

b) If $m < k$, and $m \times k$ crossbar is like demultiplexer that divides m inputs into output. However, we need to know that regular demultiplexer is $1 \times m$.

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d) Transmission of information in any network involves end-to-end addressing and sometimes local addressing.

Network	Setup	Data transfer	Teardown
circuit-switched	end-to-end		end-to-end
Datagram		end-to-end	
virtual circuit	end-to-end	local	end-to-end

Solution:

Network	Setup	Data transfer	Teardown
circuit-switched	end-to-end	is needed during the setup and teardown phase to create a connection	end-to
Datagram	independent	end-to-end	end-to
virtual circuit	end-to-end	local	end-t

Answer to Question no-6

a) change the following IPV4 addresses from binary notation to dotted-decimal notation.

a. 100000001 00001011 00001011 11101111

b. 11000001 10000011 00011011 11111111

solution

a. 129.11.11.239

b. 193.131.27.255.

b) change the following IPV4 addresses from dotted-decimal notation to binary notation

a. 1111.56.45.78

b. 221.341.7.82

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a. 01101111 00111000 00101101 01001110

b. 11011101 00100010 00000111 01010010

c) Find the errors, if any in the following IPV4 addresses.

a. 111.56.045.78

b. 221.341.7.8.20

c. 75.45.301.14

d. 111 00010.23.14.67.

Solution

a) There must be no leading zero (045)

b) There can be no more than four numbers in an IPV4 address.

c) Each number needs to be less than or equal to 255 (301 is outside the range)

d) A mixture of binary notation and dotted-decimal notation are not allowed.

d) Find the class of each address.

1) 00000001 00001011 00001011 11101111

2) 11000001 10000011 00011011 11111111

3) 14.23.120.8

4) 252.5.15.1111

23 Solution

1) The 1st bit is 0. This is a class A address

2) The 1st 2 bits are ; the third bit is 0. This is class C address.

3) The 1st byte is 14 ; the class is A

4) The first byte is 252; the class is E.

Answer to the Question no-7

~~Q~~) An organization is granted to the block 130.56.0.0/16. The administrator wants to create 1024 subnets.

a) Find the subnet mask

b) Find the number of addresses in each subnet

c) Find the first and last address in subnet 1.

d) Find the first and last address in subnet ~~2~~ 1024.

Solutions:

(a) $\log_2^{1024} = 10$ extra 1s = 10 possible : 1024

Mask : 126

(b) $2^{32-26} = 64$ addresses per subnet

(c) subnet 1 : 130.56.0.0.

First address in subnet 1 : 130 . 56 . 0 . 0

Number of address : 0 . 0 . 0 . 63

last address in subnet 1 : 130 . 56 . 0 . 63

d) Subnet 1024:

130.56.0.0 + 0.0.22.192 = 130.56.255.192

First address : 130 . 16 . 255 . 192
number of address : 0 . 0 . 0 . 63
last address : 130 . 56 . 255 . 255.

Answer to the Question no-8

Answer to the question no-8

(a) The network layer is concerned with — of data solutions packets.

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b) which one of the following is not function of netwoor layer?

Solution: error control. In the OSI model, network layer is the third layer and it provides data routing paths for network communications. Error control is a function of the data link layer and the transport layer.

c) which of the following routing algorithms can be used for network layer desing?

Solution:

The routing algorithm is what decides where a packet should go next. There are several routing techiques like shortest path algorith, static and dynamic routing, decentralized routi distance vector routing, link state routing, Hierarchical routing etc. The routeing algorithm go hand in ha with the operations of all the rou in the networks. The routers are the main participants in th algorithms.

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Q) what is spanning tree?

Solution:- A subset of network that includes all the routers but contains no loop is called.