CN 2013 PAST PAPER SOLUTION

Solved by

Muhammad Saad

Muhammad Fateh

Atif Pervaiz

Mohsin Shabbir

Mohsin Raza

Short Questions

Q2

(1)

Time Division Multiplexing

Time Division Multiplexing (TDM) is applied primarily on digital signals but can be also be applied on analog signals. TDM the shared channel is divided among its user by means of time slot. Each user can transmit data within the provided time slot only. Digital signal are divided in frames, equivalent to time slot i.e. frame of an optimal size which can be transmitted in given time slot. TDM works in synchronized mode. Both ends i.e. Multiplexer and De-multiplexer are timely synchronized and both switch to next channel simultaneously.

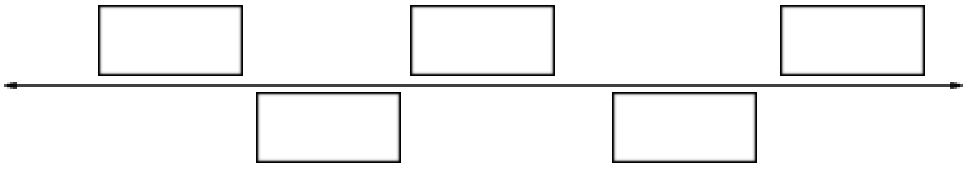
Frequency Division Multiplexing

When the carrier is frequency. FDM is used. FDM is an analog technology. FDM divides the spectrum or carrier bandwidth in logical channels and allocates one user to each channel. Each user can use the channel frequency independently and has exclusive access of it. All channels are divided in such a way that they do not overlap with each other. Channels are separated by guard bands. Guard band is frequency which is not used by either channel.

(2)

Bus Topology

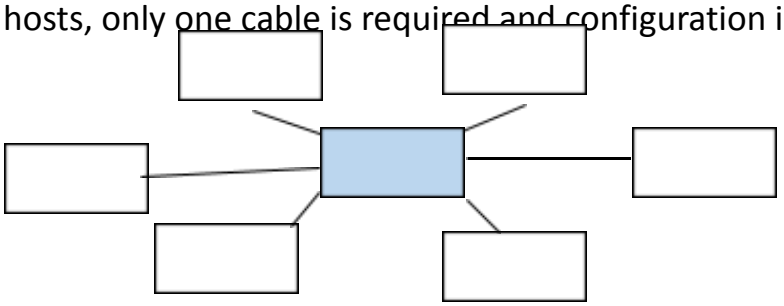
All devices share single communication line or cable. Bus topology may have problem while multiple hosts sending data at the same time. Therefore, bus topology either uses CSMA/CD technology or recognize one host as Bus master to solve issue. It is one of the simple forms of networking where a failure of a device does not affect the other device. But failure of the shared communication line can make all other devices stop function. Both ends of the shared channel have line terminator. Data is sent in only one direction and as soon as it reaches the extreme end, the terminator removes the data from the line.



Star topology

All hosts in star topology are connected to central device, known as hub device, using a point to point connection. That is, there exists a point to point connection between hosts and hub.

As in bus topology, hub acts as single point of failure. If hub fails, connectivity of all hosts to all other hosts fails. Every communication between hosts, takes place through only the hub. Star topology is not expensive as to connect one more hosts, only one cable is required and configuration is simple.



(3)

Bandwidth B = 4 kHz = 4 x 1000 Hz = 4000 Hz

Signal discrete levels M = 4

Data rate $D = 2 * B * M$ ----- (i)

Putting these values in equation 1

$D = 2 * 4000 * 4$

D= $2 * 4000 * 2^2$

D=$2 * 4000 * 2$

$D = 16000\ bps$

(4)

Bandwidth = 150 kHz = 150 x 1000 Hz = 150000 Hz

Quantization levels = 512

I. Nyquist Theorem state that, the sampling rate must be at least $2f_{max,}$ or twice the highest analog frequency component. The Nyquist Theorem,

also known as the sampling theorem. For analog-to-digital conversion to result in a reproduction of the signal, slices, called samples, the analog waveform must be taken frequently. The number of samples per second is called sampling rate or sampling frequency. The highest frequency component in an analog signal determines the bandwidth of that signal.

$f_s \geq 2f_{max}$

$f_s \geq 2*150000 = 300000$ Hz = 300 kHz

II. $bitrate = 2 * B * M$

$$bitrate = 2 * 150000 * 512$$

$$bitrate = 2 * 150000 * 2^9$$

$$bitrate = 2 * 150000 * 9$$

$$bitrate = 2700000\ bps$$

$$bitrate = 2700\ bps$$

(5)

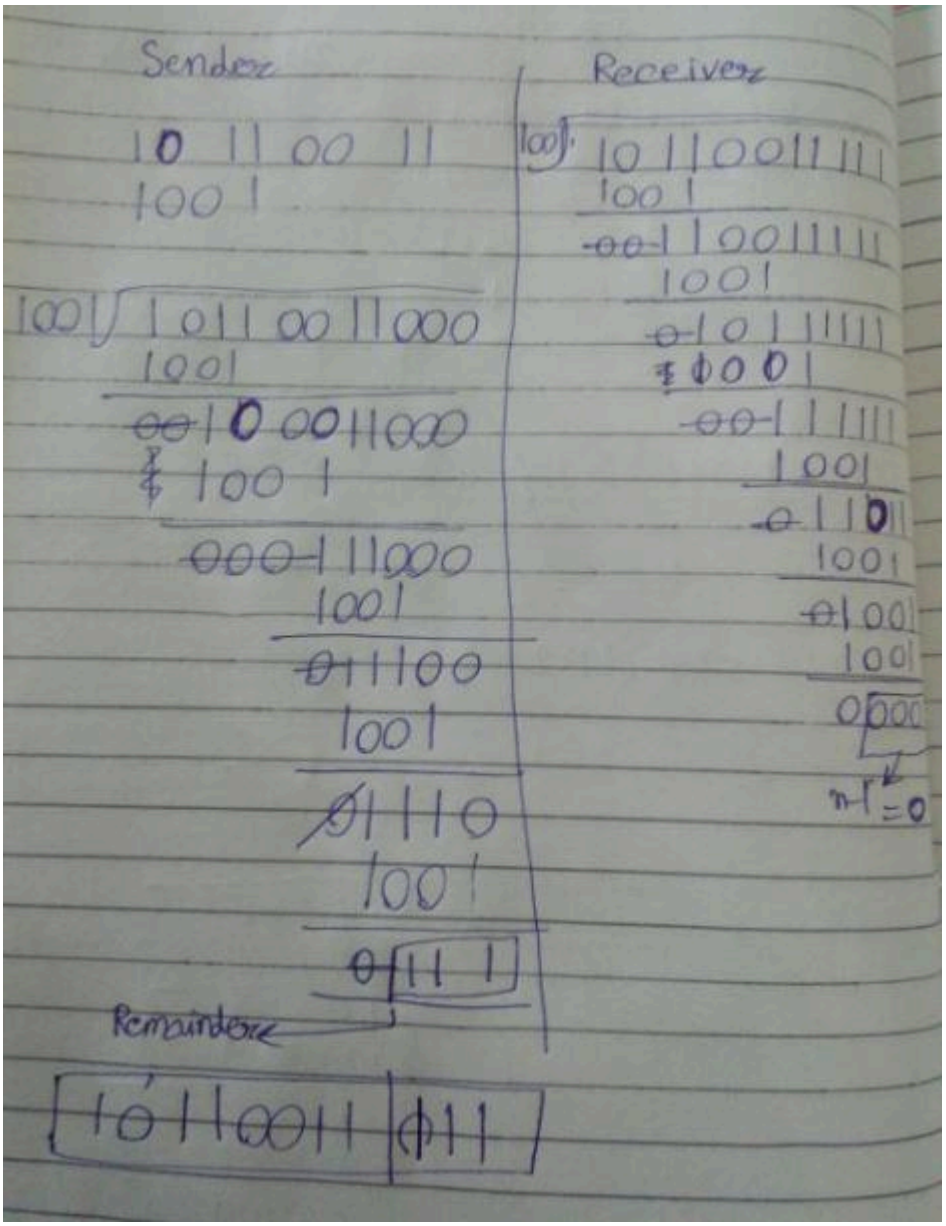
Bits	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**1**
NRZ-I								
Manchester								

Long Questions

Q3

(a)

Data unit = 10110011, divisor = 1001, remainder =111



Since at the receiver side the remainder is 0000 so its means that there is no error in the data unit and the data is successfully received by the receiver.

(b)

IP address: 170.110.88.0

Required subnets = 56

Host per subnet = 32

Subnets	1	2	4	8	16	32	64	128	
	128	64	32	16	8	4	2	1	hosts

It is a class ‘B’ address so it has 2 networks octet, 2 hosts octet. For sub-netting we use host bits. So what we do in these bits.

	128	64	32	16	8	4	2	1		128	64	32	16	8	4	2	1
170.110.	0	1	0	1	1	0	0	0	.	0	0	0	0	0	0	0	0

Subnets bits= 6

Subnets ≥ required subnets

64 ≥ 56

Hosts bits = 5

i) We require 6 bits for subnet ID
ii) There are 64 usable subnets
iii) 255.255.95.224
iv) 107.110.88.35 □ because we start counting hosts from 170.110.88.33, the address 170.110.88.32 is subnet ID that cannot be used as a host.

Q4

Application	Reliability	Delay	Jitter	Bandwidth
Text chat	High	Low	Low	Low
File transfer	High	Low	Low	High
Video conferencing	Low	High	High	High
Web access	High	High	Low	High

(a)

(b)

To	A	I	F	C		New estimate delay from E	Line
A	0	24	20	21		8	A
B	12	36	31	28		20	B
C	25	18	19	0		6	C
D	40	27	8	24		20	D
E	8	10	12	6		0	-
F	23	20	0	40		12	F
G	18	31	6	31		18	G
H	17	20	17	19		25	H
I	21	0	14	22		10	I
J	9	11	7	10		16	J
K	24	22	22	24		30	K
L	29	33	9	9		15	L
	EA Delay Is 8	EI Delay Is 10	EF Delay Is 12	EC Delay Is 6		New routing table for E	