Recap

Flat top sampling

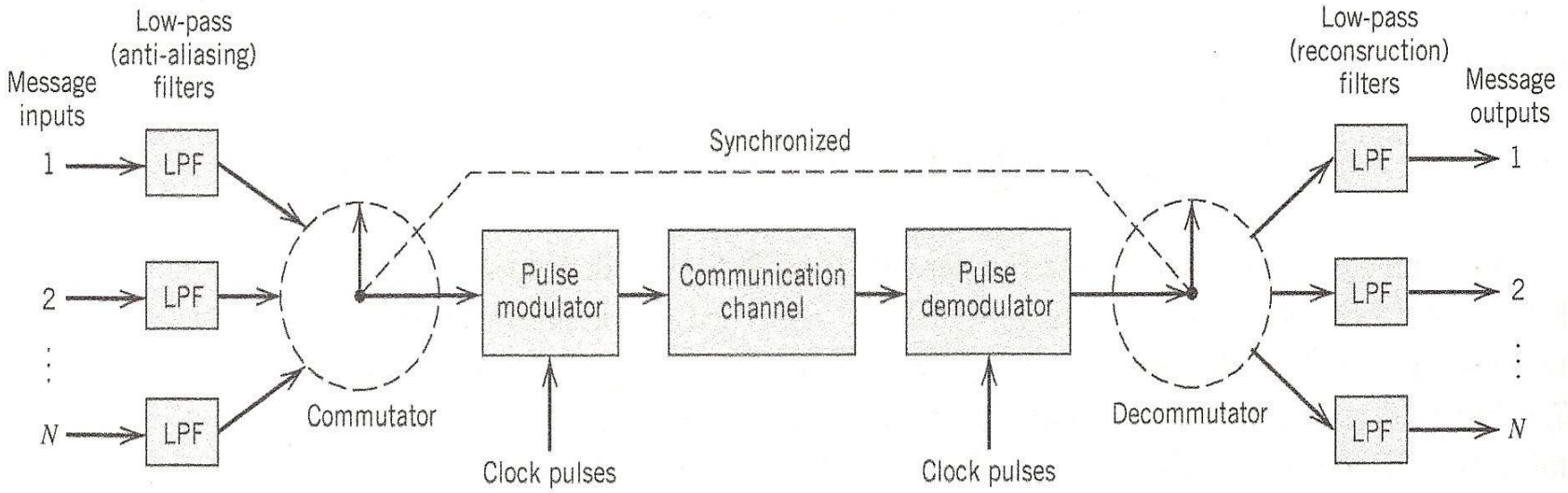
Signal recovery – Sample and Hold circuit

Topics for this session

Time Division Multiplexing

DIGITAL COMMUNICATION

Time Division Multiplexing(TDM)



Time Division Multiplexing(TDM)

- Low-pass pre-alias filter – Restricts bandwidth by removing unwanted frequencies.
- Commutator – To interleave samples sequentially, of each of N messages.
- Pulse amplitude modulator – To transform multiplexed signal into a form suitable for transmission.
- Commutator and Decommutator operate in synchronism.
- T_s – Denotes sampling period.
- T_x – Denotes time spacing between adjacent samples.

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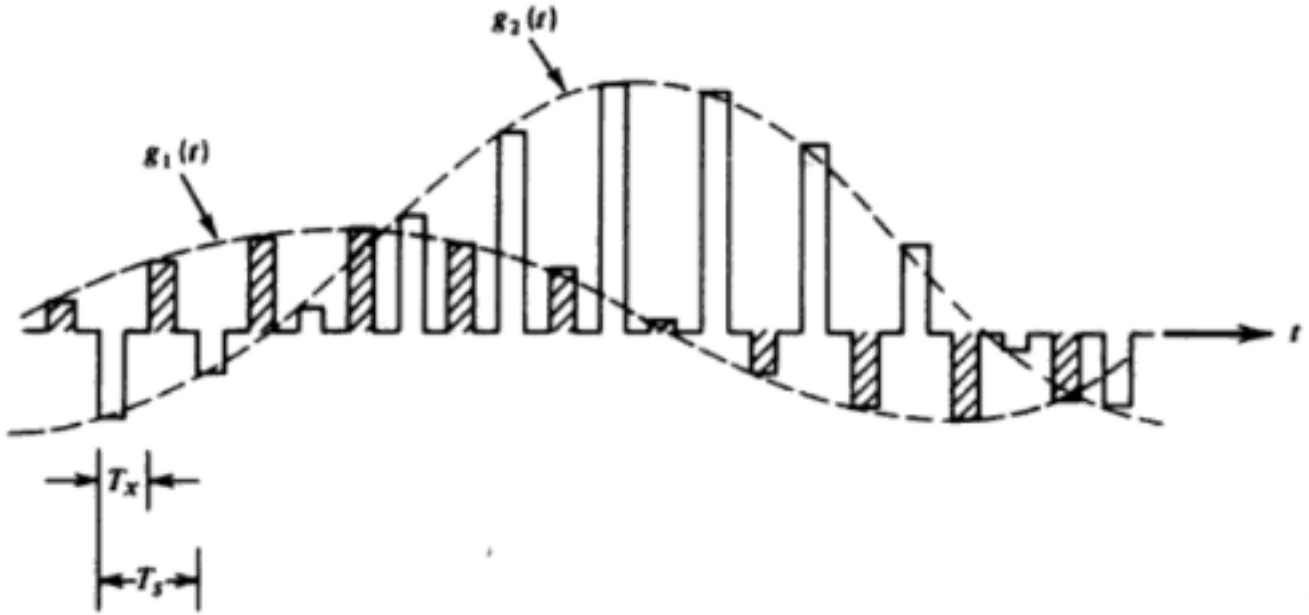
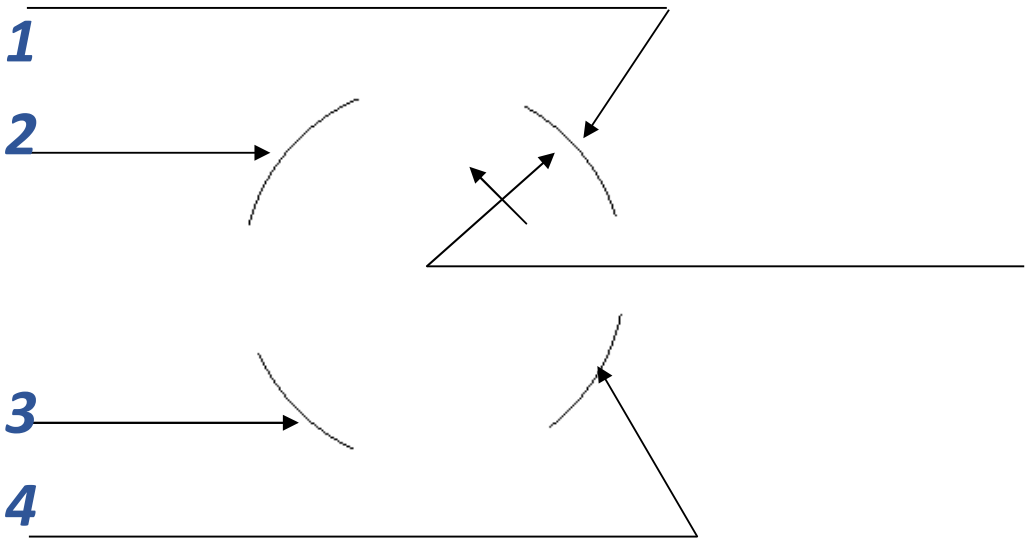
Time Division Multiplexing(TDM)

Spacing between adjacent samples is

$$T_x = \frac{T_s}{N}$$



Commutator arrangement for four signals



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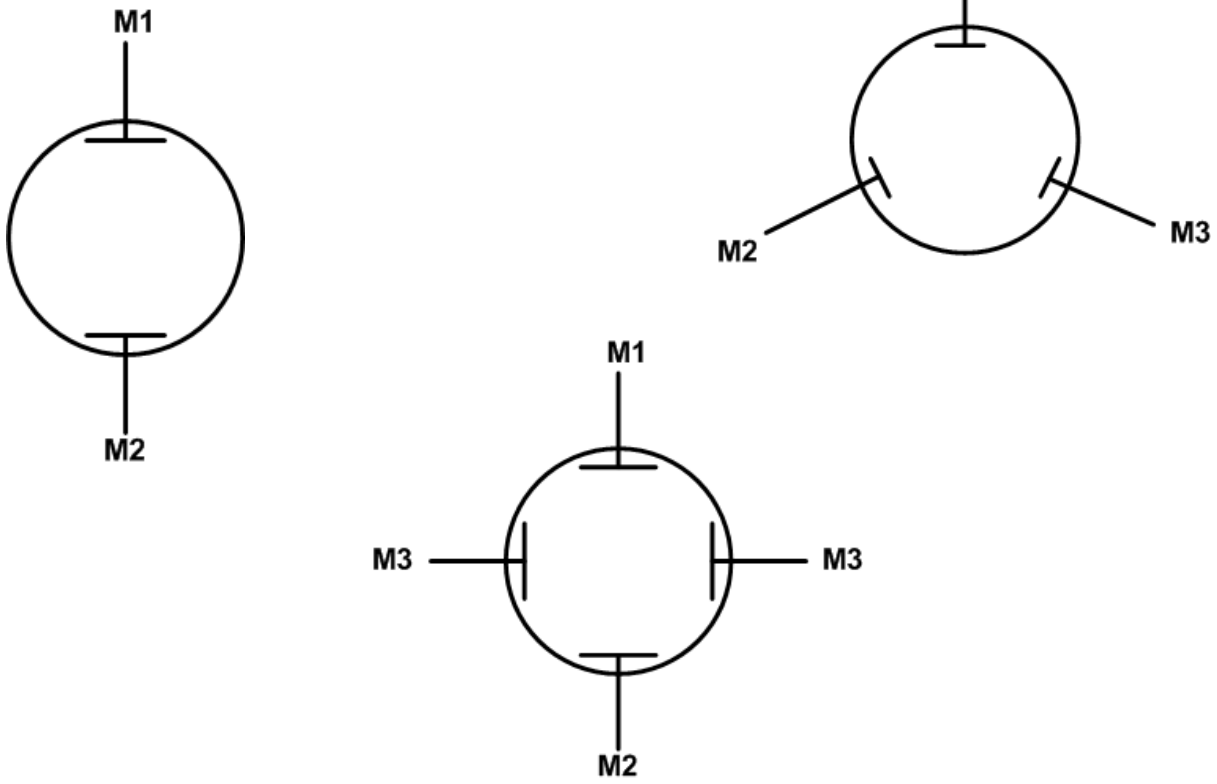
Time Division Multiplexing(TDM)

Commutator arrangement



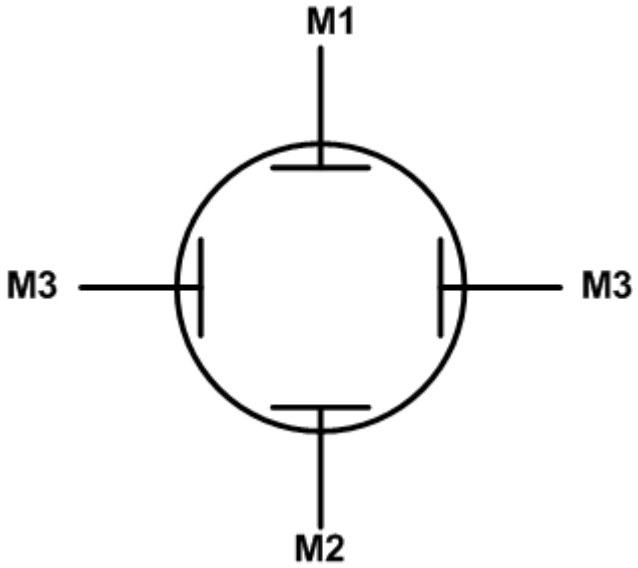
Problems

1. Three independent message signals of bandwidths W, W and 2W are to be Time division multiplexed. Design a TDM scheme for Nyquist rate sampling.

Bandwidth	Sampling rate	Contacts/ segments
W	2W	1
W	2W	1
2W	4W	2

- Commutator rotates at 2W revolutions/second

Time Division Multiplexing(TDM)



- Total number of samples sent per sec fs=(2w+2w+4w) = 8w
- Transmission bandwidth = fs/2 = 4w

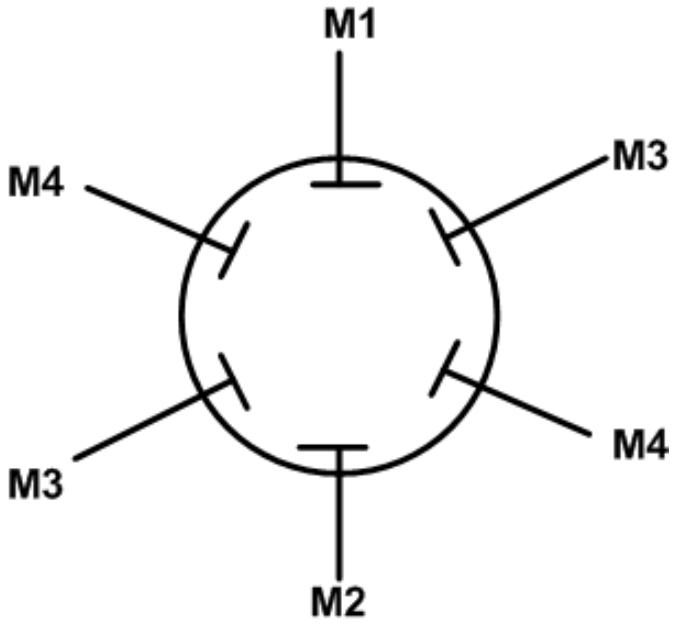
Problems

2. Four independent message signals of bandwidths W,W,2W,2W are to be Time division multiplexed. Design a TDM scheme for Nyquist rate sampling.

Bandwidth	Nyquist rate	Contacts/ Segments
W	2W	1
W	2W	1
2W	4W	2
2W	4W	2

- commutator rotates at 2W revolutions/second

Time Division Multiplexing(TDM)



- Total number of samples sent per sec fs=(2w+2w+4w+4w) = 12w
- Transmission bandwidth = fs/2 = 6w