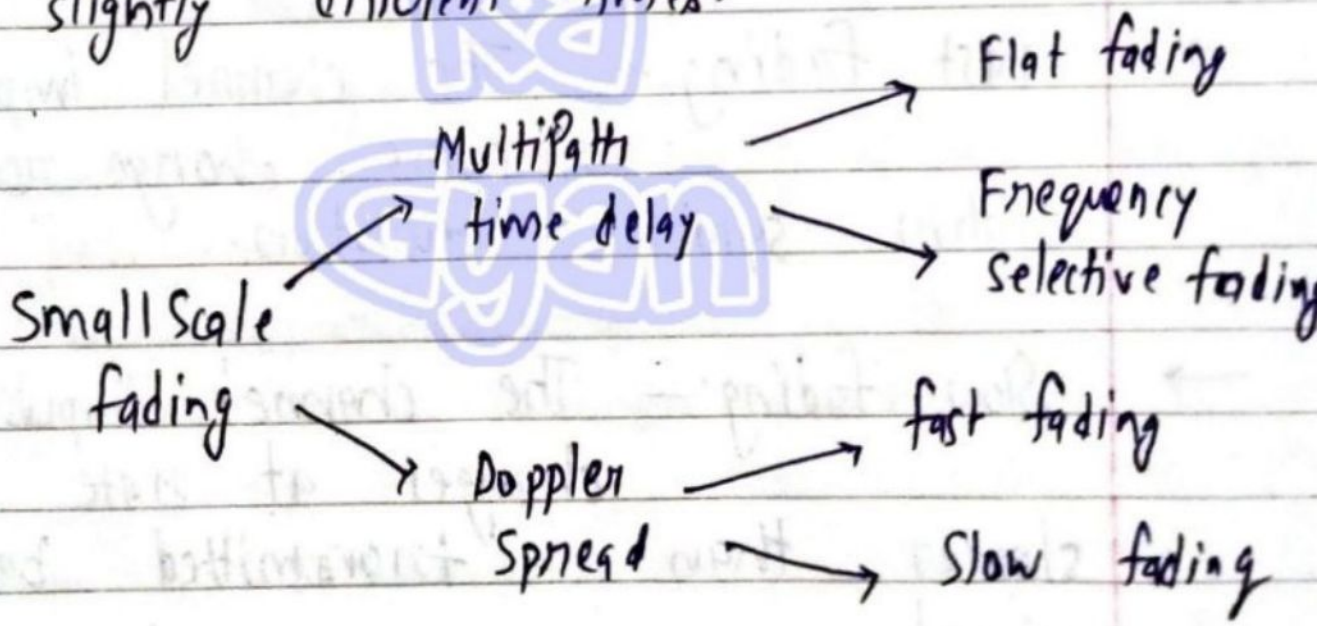
Q.1 Explain Small Scale fading briefly?

Ans - This refers to the fluctuation in signal strength and phase over short distance and small duration of time. It is also called Rayleigh fading. Small fading affects almost all forms of wireless comm and overcoming them is a necessity to increase efficiency & decrease error.

Fading is called by interference b/w 2 or more session of transmitted signal which arrives at receiver at slightly different times.



- Multipath time fading:- It occurs when signal reaches the receiver from various path i.e. when multipath propagation takes place.

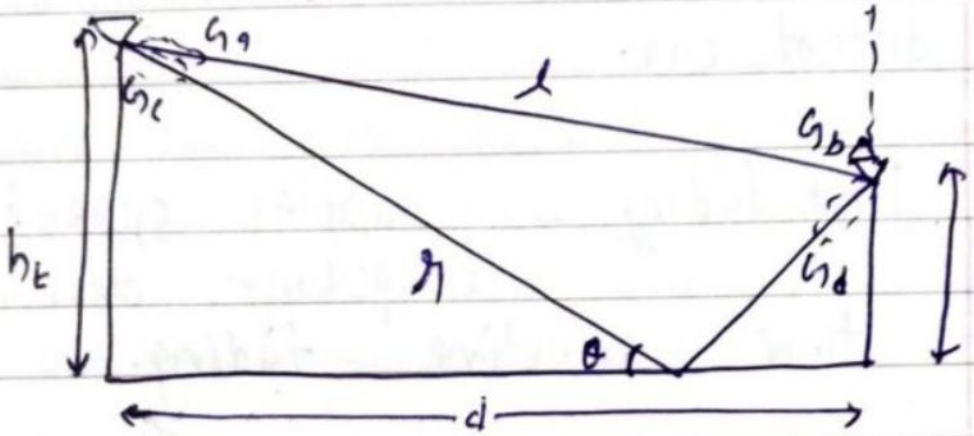
where A = Effective Area
on Aperature of antenna

$G_R = \frac{4\pi A}{\lambda^2}$

Q.1 Explain two ray model with diagram

Ans- The two rays ground reflection model is radio propagation model which products it path losses b/w its transmitting antenna & a receiving antenna when they are in line of sight.

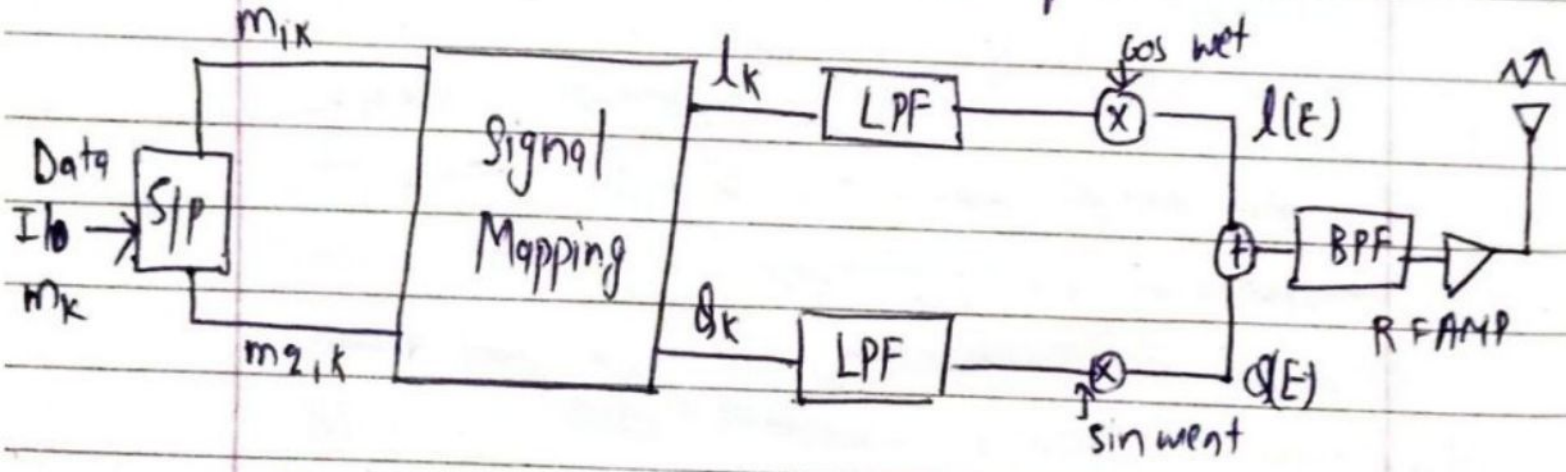
The main reasons due to which multipath effect is generated could be reflection, diffraction & scattering.



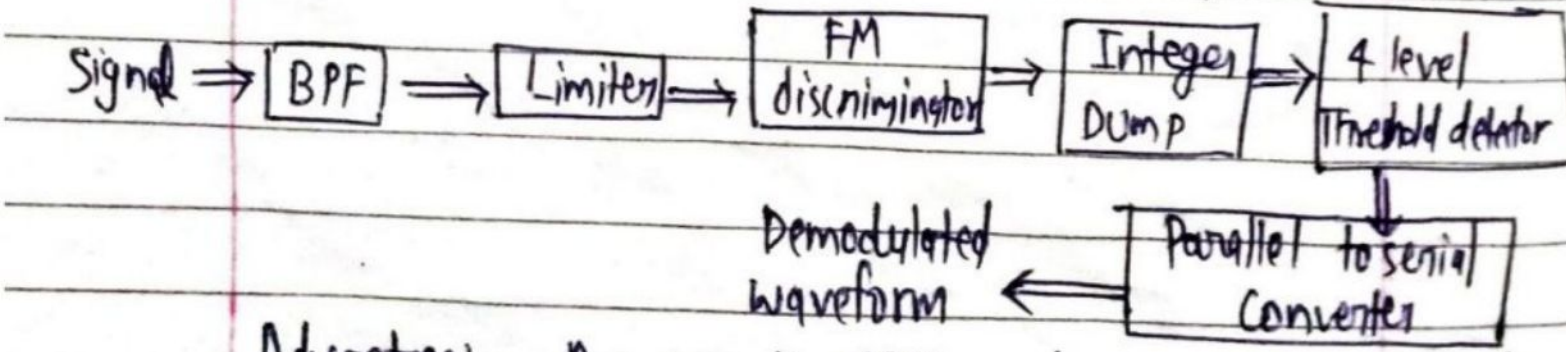
Power $P_r = P_t \left[\frac{\lambda}{4\pi}\right]^2 \left[\frac{\sqrt{G_R}}{l} + \frac{R\sqrt{G_r e^{j\phi}}}{x+x'}\right]$

Q.1 Explain π/4 QPSK.

Ans- In π/4 QPSK, the max. phase change is limited to ± 135° as compared to 180° QPSK Hence the signal preserves the constant envelop property better than band limited QPSK. This can be demodulated in a coherent or non-coherent fashion thereby simplifying the receiver design greatly.
In presence of multipath spread and fading, π/4 QPSK is found to perform better.
QPSK transmission technique:



π/4 QPSK discrimination detection:-

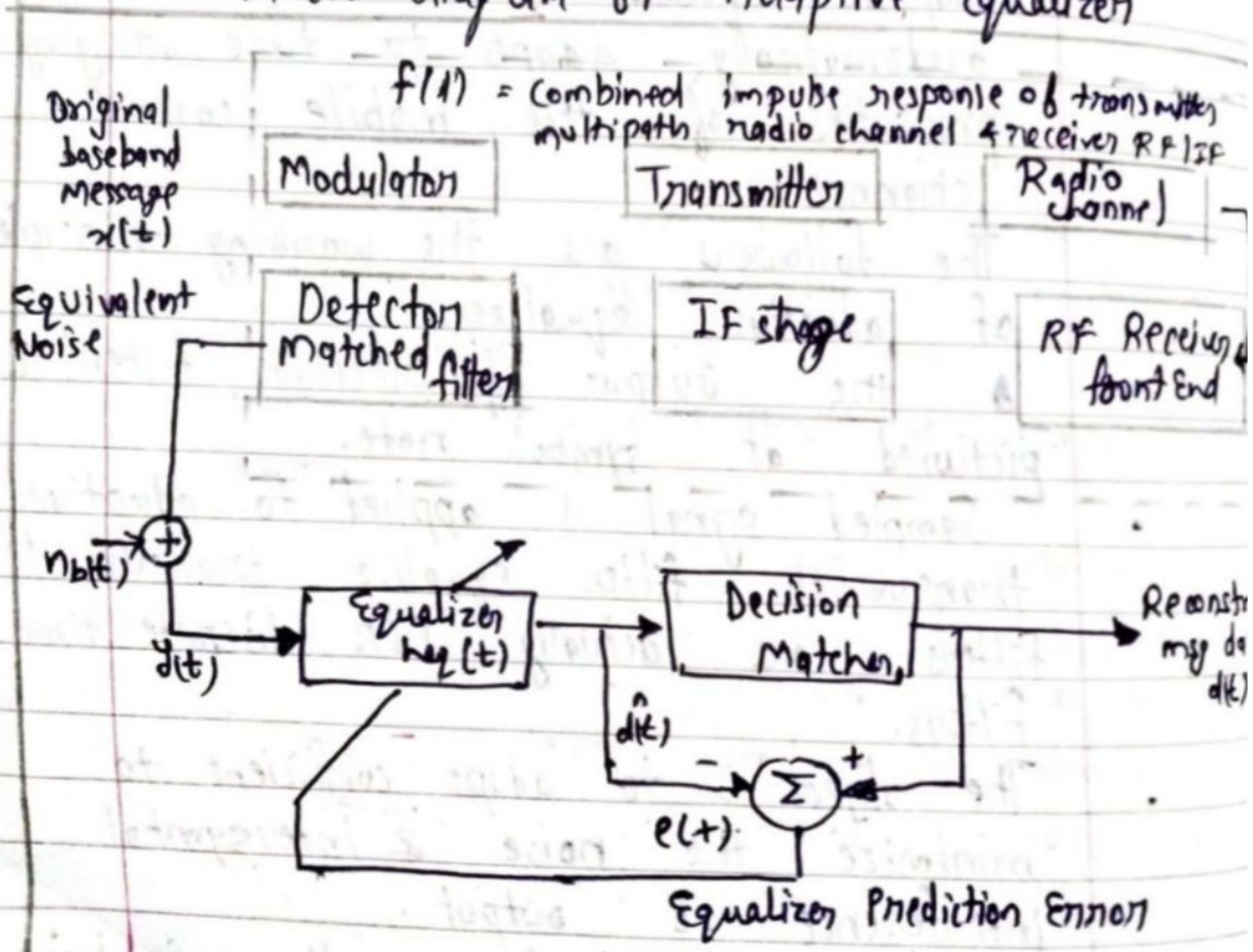


Advantage:- Among all MPSK schemes, QPSK is most often used scheme since it doesn't suffer from BER degradation while bandwidth

error signal.

- Decision Directed equalizer: This also indicates that adjustment is efficient in tracking slow variation in channel response.

Block diagram of Adaptive Equalizer



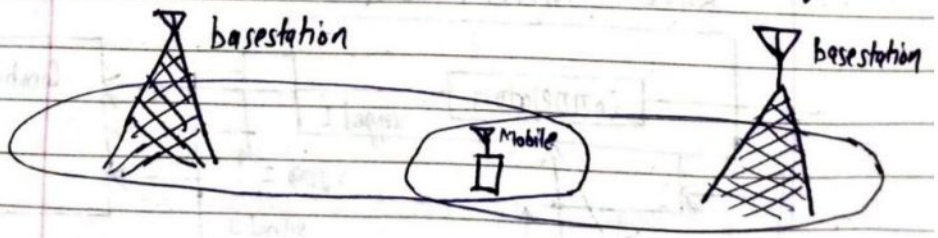
Q.2 Ans- Explain Linear & non-linear Equalization.

Linear Equalization :- The output of decision maker is not used in feedback path to adapt the equalizer.

Microscopic diversity techniques can exploit the rapidly changing signal.

(ii) → By selecting a basestation which is not shadowed when others are, the mobile can improve avg. signal to noise ratio on forward link. This is Macroscopic diversity.

- It is used to combat slow fading

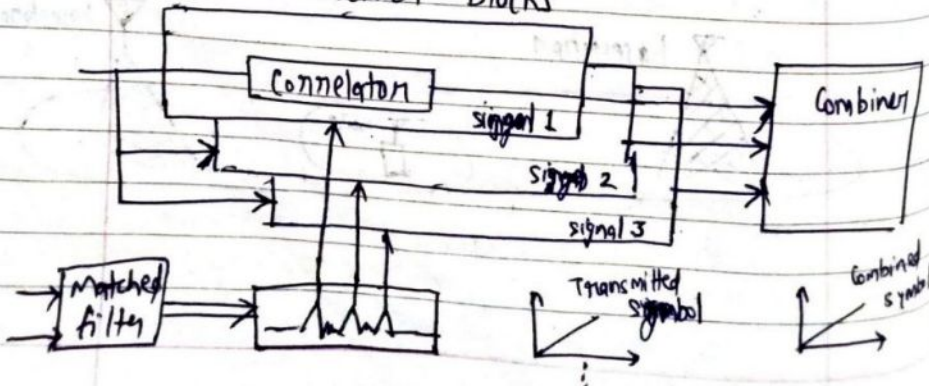


Q.5 Define Rake Receiver

A rake receiver is a radio receiver designed to counter the effects of multipath fading. It does this by using several "sub-receivers" called fingers.

- Rake receiver mitigates multipath fading effect.
- Multipath fading is a major cause of unreliable wireless channel characteristics.
- The Rake receiver was designed to equalize the effect of multipath.
- It uses a combination of correlators, lock generator to spread out individual echo signals of multipath.
- Each signal is then delayed according to peaks found is received signal.
- A Rake receiver is a radio designed to counter affects of multi
- Each component is decoded independently

Rake Receiver Blocks



Q.5 Define capacity in fading & non-fading channel?

Ans -

Capacity is a channel characteristics no dependent on transmission or reception techniques or limitations.
The fading channel capacity with channel side information at receiver & transmitter is achieved when transmitter adapt in power, data rate & coding scheme to channel variation.

Channel capacity is the maximum mutual information.

We use Shannon's capacity theorem for calculating the capacity

$$C = W \log_2\left(1 + \frac{S}{N}\right)$$

W = Band width
S = Avg. signal power
N = Avg. Noise power
channel in non-fading channel.

Capacity for time invarient frequency selective fading channel is hard & it is achieved by watch filling algo.

The channel capacity is approxim, obtained by dividing up the band width of sub bands, which is equal to coherence bandwidth.

Capacity of channel H = sum o

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