Assignment - 1

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Q1] What is antenna. List all types of antenna and explain. List the advantages of smart antenna.

⇒ Defination: An antenna is a device that converts electrical signal into electromagnetic wave and vice-versa.

Types of Antenna

① Simple antenna :
(Hertzian dipole)
→ It consist of straight thin conducting wire/rod oriented vertically/horizontally
→ It length is usually half the wavelength of EM wares it is designed to transmit/receive.
→ Application: Radio Broadcasting, wireless communication

② Macroni Antenna :
→ It consist of single vertical wire, suspended above ground
→ It operates on quarter-wave monopole antenna with length $\frac{1}{4}^{th}$ of the EM wave it receives and transmit
→ Application: Early radio, Telegraphy.

③ Directional antenna.
→ These antennas focus their radiation in one particular direction.
→ Application: point-to-point communication.

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(4) Sectorized antenna

→ They divide the coverage area into multiple sectors typically 3 or more, each with its own dedicated antenna element or array

→ like other directional antenna, sectorized antenna have focused radiation pattern that concentrate energy in specific direction

→ Application: Cellular network, wifi-network.

(5) Diversity antenna

→ It consist of 2 or more antenna elements, spaced apart physically or located in diff spatial positions.

→ These elements capture signals from diverse propogation path.

→ Application: Wireless communication systems, mobile devices

(6) Omnidirectional antenna

→ The provide coverage in all horizontal direction

→ They general have low range than direction antenna

→ Application: wifi-network,

Advantages of smart antennas ⇒.

(1) Spacial filtering
(2) Beam forming
(3) Spatial Diversity
(4) interference rejection
(5) Adaptive beam steering
(6) Dynamic reconfiguration
(7) Enhanced security.

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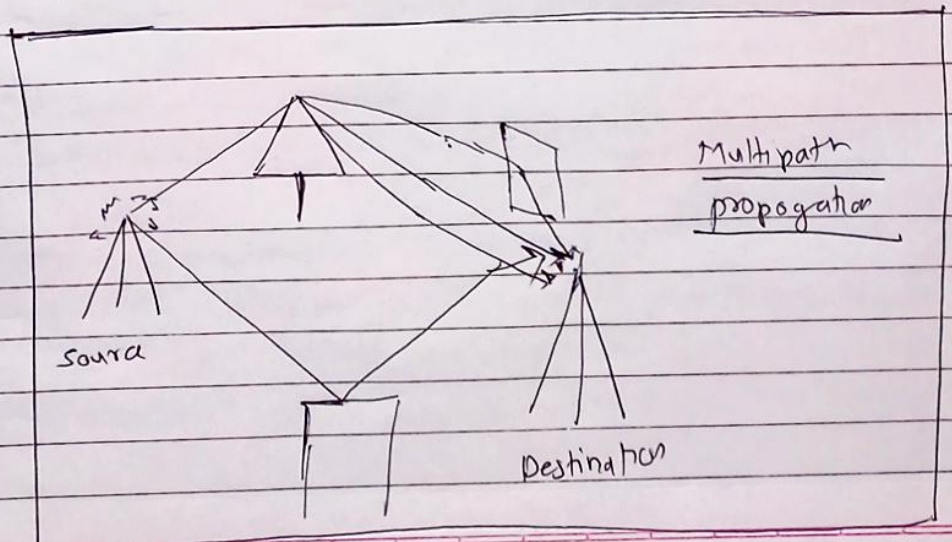
Q2] Describe how the path of signal gets distorted because of Attenuation and the Signal travels through multipath, List effect of mobility highlight fady

⇒ ① When the signal travels from it's source to destination it come across various obstacle.

② These object affect the signal to deviate / disroute from its path this is called attenuation.

③ Types of attenuation
- → shadowing
- → reflection
- → refraction.
- → scattering
- → diffraction.

④ Due to attenuation like scattery and diffraction, a signal is broken in parts resulting in each part following diff route as a result signal travel through multiple path.



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(5) Effect of mobility

→ Signal path change
→ different delay variation of diff signal parts.
→ Doppler shift.
→ Fading ⇒

Fast Fading → It occurs due to rapid change in the amplitude and phase of the received signal caused by multipath propagation

Slow Fading → It occurs due to gradual changes in the received signal strength caused by large scale obstacles.

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