1. Why and how FCC manages Spectrum?

Ans-

FCC Manages oversees spectrum allocation for commercial usage -maritine radio, navigation, AM radios, aviation, shortwve, VHF, FM radio, UHF television, mobile phones, GPs, 4G,satellite communications Wifi, Radiom Astronomy, satellite, communications

Why it manages spectrum?

Scarcity –

* Limited resource, source of government revenue
* Interference is managed with careful frequency planning
* Helps in spectrum harmonization, Equipment licensing or certification
* Defines modulation requirements
* Specifies assigns allocated occupies band width

Transmit Power(safety) is harmful for humans

* Avoid high transmission power of devices and cables (conducting wires) around for human safety

High Frequencies are harmful for humans

* Harmful Radio frequencies have spurious emissions conducted or radiated

2. How gov classifies Spectrum and what is its Mission and Vision about Spectrum?

- Gov classifies spectrum based on licensing

- Shares, Licensed and Unlicensed band

Licensed Band –

* Required to be purchased for transmission or reception, frequency planning avods interference
* Advantage – Known and predictive interference
* Disadv – requires central management
* Example, GSM UMTS, LTE, TV broadcasting

Shared –

* Sharing decouples the spectrum about application
* Cognititve radio is a technique of spectrum sharing
* In future more shared spectrum will be used, since it helps in optimizing the usage of frequency band.
* Multiple Categories of users can share the same frequency bands.
* Mobile operatirs use low-mid and high band frequencies
* And can switch between LTE and 5G new radio coverage based on their network traffic demands.

Unlicensed bands –

- Reserved for Industrial Scientific and Medical purposes -2.4 Ghz, 5.8 Ghz, 60 Ghz

- Does not require FCC licensing – equipment must be certified for compliance

used for short range low power wireless communication

users have no regulatory protection

- used in Wireless LAN

- microwave ovens, cordless phones, wifi, Bluetooth devices, Near Field Communciation devices

Governments Mission/vision about spectrum ---

To adopt economic ways to approach national spectrum management

Promote general principle of spectrum sharing

Monitor spectrum

Define long term strategy for efficient spectrum utilization.

Gov goals

* Rights of access to a specific spectrum should be authorized
* Efficient use of allocated band
* Operations free from interference
* Electromagnetic compatibility
* Economies of scale
* Interoperability and roam
* Global harmonization in spectrum allocation

Helps in maintaining- Advantages – good quality and less costly equipment, more favorable investment, env hould be clear and stable

3. Spectrum Reform policy needs and goals

Needs –

New technologie emerging and need for a faster means of channlizng means faster and more spectrum allocation for commercial uses

* Spectrum s insufficient for commercial uses
* Available spectrum is not used efficiently
* License rules limit market flexibility

Problem –

* Sharing opportunities are missed
* Innovation are blocked
* High marginal cost for spectrum bankrupt the service providers

These havr created articial spectrum scaracity

Goals –

* Accelerate ilress broadband revolution
* Promote adoption of advanced technology
* Encourage convergence of internet and wireless
* Reform underused spectrum
* Enable new business models – Value added service providers

Licensed Bands - 9Khz to 300Mhz in high demand specially VHf – 30-300Mhz

Unlicensed bands – 2.4 Ghz, 5.8 GHz, 60 Ghz

Mission / Vision –

Adopt economic approaches to national spectrum mngmnet

Promote general principles of specrum sharing

Monitor specrum

Define long term strategies for efficient spectrum utilization

Why manage spectrum

Goal -Use / efficient use of spectrum

Operation free from interference

EM Compatibility

Economies of scale

Interoperability and roaming

Advantages – good quality \* less costly equipment, more fav investment, env (clear & stable)

Who manages Spectrum?--- NTIA & FCC --

National Telecomm & information administration – NTIA for gov use- emergency public safety, defence, aviation NASA

FCC – commercial use,

FCC Manage- oversees spectrum allocation for commercial usage

* Security
* Transmit power safety for human
* High frequency – harmful for human,

Scarcity –

Scare resource

Source of gov revenue

Interference managed well thru careful frequency planning

Helps in international spectrum harmonization,

Equipment licensing /ceritifcation

Define modulation reqs

Specified assigns and allocated bandwidth

Transmit power for human –

High transmit power, 100% coupling – 0% coupling

High Frequencies –

Are harmful for humans, RF supruius emissions conducted and radiations

Radio waves based on icense

How FCC manage spectrum –

* Actie it sgoals thru licensing th spectrum
* Commecial is allocated assigned thru buding
* 1993 aution are done
* Radio spectrum can e classified based on licensing
  + Licensed and unlicensed and Shared spectrum

ISM- Industrial Scientifc and Medical uses 0—unlicensed band

Not paid fees, walkie talkie, infrared, NFCbluetooth, zigbee,

Classification of spectrum – licese, shared unlinces

Licensed is required to purchase for transmission or reception

Freqency planning avoids interference

Advantages – known and predictive interference

Disadvantages- requires central management

e.g. GSM UMTS, LTE TV Broadcasting

Shared – sharing decouples spectrum from applicatios

Cogintive radi is one technique for spectrum sharing

Future is of shared spectrum

It allows optimizing use of spectrum

Multiple category of users to share same freq band, mobile operatiors use low mid and high band freq and dynamically switch betn LTE & 5G new radio coverage base on network traffic demands

Unlicensed – ISM purpose – 2.4 GHs, 5.8 Ghz, 60Ghz

Does not require FCC license, equipment must be certificed for compliance, used for short range low poer wireless communication, usrs have mo regulatory protection

Exmaple- microwave ovens , cordless phones, wifi, walkie takie, bluetoothh

NFC devices

IEEE based wireless nw

Unlicencsed PAN LAN

Licensed Based. – MAN , WAN