(ii) Data can be encrypted and decrypted to stop data surveillance by intruder over space.

(iii) In case of transmission error:

(a) Error detecting codes (CRC) algorithm can be used to see if any error has taken place.

(b) If so, Then there can be error recovery algorithm (like stop & wait, sliding window) protocol algorithm can be executed by to take care of transmission Error.

(c) Also error correcting codes can be used.

But (a) & (b) is used for computer data communication

No Page ① Page - ~~06~~ (02)

(01)(i) Digitization of voice:
If a signal has got maximum frequency ~~fsm~~ fsm
Then according to Nyquist criterion or Theorem.
No of Samples per second
= ~~2 x fsm~~ 2 x fsm. —

(ii) Each Sample is digitized using n bit / Sample.
So Total transmission Rate of voice/Music = 2 x fsm x n —
telephonic

(iii) for voice fsm = 4 kHz —
n = 8 bit
Data rate for Telephonic voice
= 4 x 2 x 8 = 64 kbps.

(iv) for Music fsm = 20 kHz
n = 16 bit —
∴ Data rate for Music = 20 x 2 x 16 kbps
for Mono Music —

(v) For Stereo Music = 2 x Mono che

(01) Actually Music BH = 21.5 KHz (Not 20 KHz)

Calculate value of stereo Music

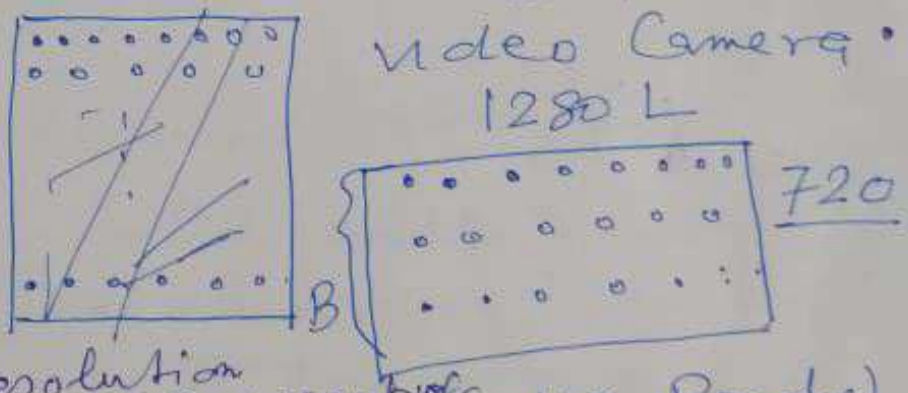
$2 \times 21.5 \times 2 \times 16$ kbps

⇒ Un compressed Stereo BH Music

⇒ MP3 Compression 144 kbps

(02.) Video digitization:

Digital Video Camera.



(i) HD TV Resolution 1280×720 pixel (HD Ready)

(ii) Today Aspect Ratio = B/

$= \left(\frac{3}{4}\right)^2 = \frac{9}{16}$

(iii) (Earlier Aspect Ratio = 3/4)

(iv) $\frac{80}{1280} \times \frac{9}{16} = 720$

(v) One screen = one Frame = 1280×720 pixel.

Each pixel = R ⇒ 8 bit
G ⇒ 8 bit
B ⇒ 8 bit

(vi) one TV frame = 1280 × 720 × 24 bit

(vii) To bring continuity of motion picture 50 frames/sec. (persistence of vision, creates illusion

(viii) Total Datarate able Digitization = 1280 × 720 × 24 × 50 ? = ✓

(ix) Compressed by MPEG4 (MP4) = 2 to 6 Mbps.

(x) Variable bit Rate
Classroom video = 2 Mbps
Horse Race over Montain Range = 6 Mbps

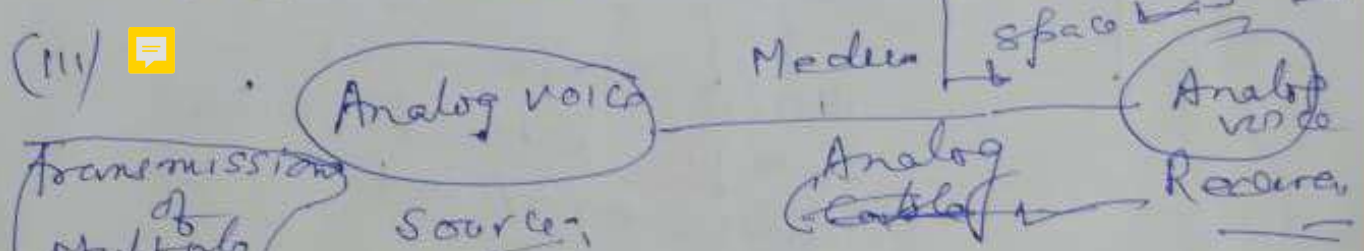
Conclusion Due to lot of Advantage of Digital transmission today
(i) Computer data ⇒ originally digital
(ii) Telephonic voice: Digitized at 64 kbps
(iii) MP3 Music = Digitized compressed
(iv) MPEG4 video = " "

Distinction between Digital/Analog transmission and Digital/Analog Communication.

(i) Transmission is w.r.t media

(ii) Communication is w.r.t end to end basis

(iii)



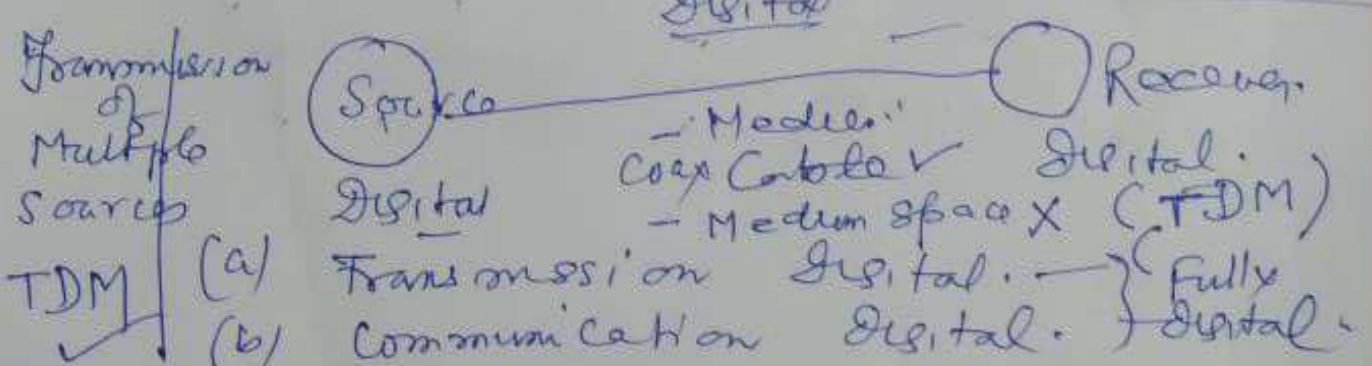
Transmission of Multiple sources FDM

(a) - Communication is analog

(b) Transmission is analog

Example of transmission of Analog Music/TV in space.

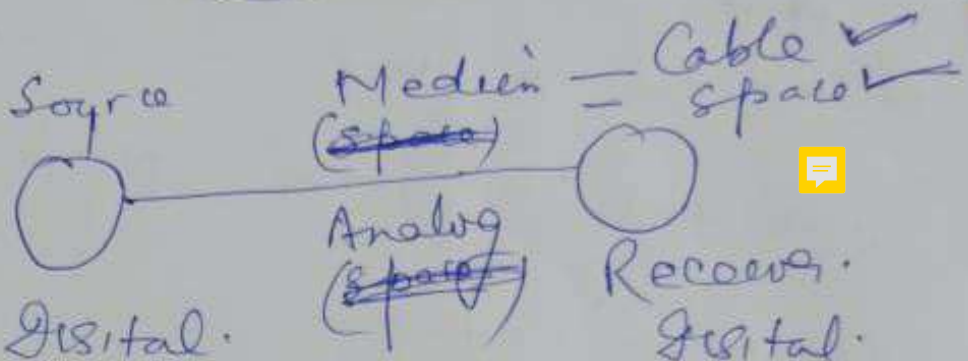
(iv) Digital:



This is an example Digital transmission over Cable: Enjoys all benefits of Digital communication

(V)

Multiplexing
Source
Digital
Transmission
FDM

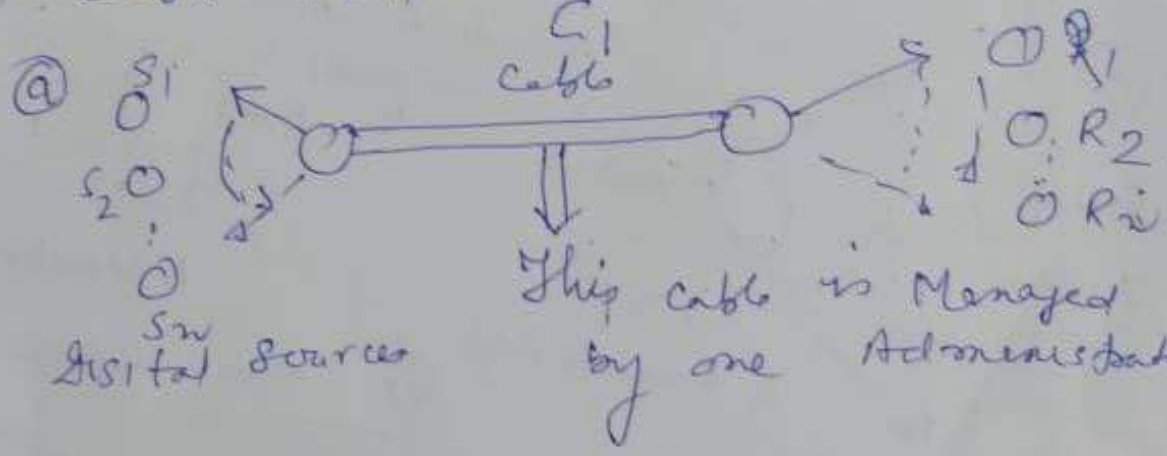


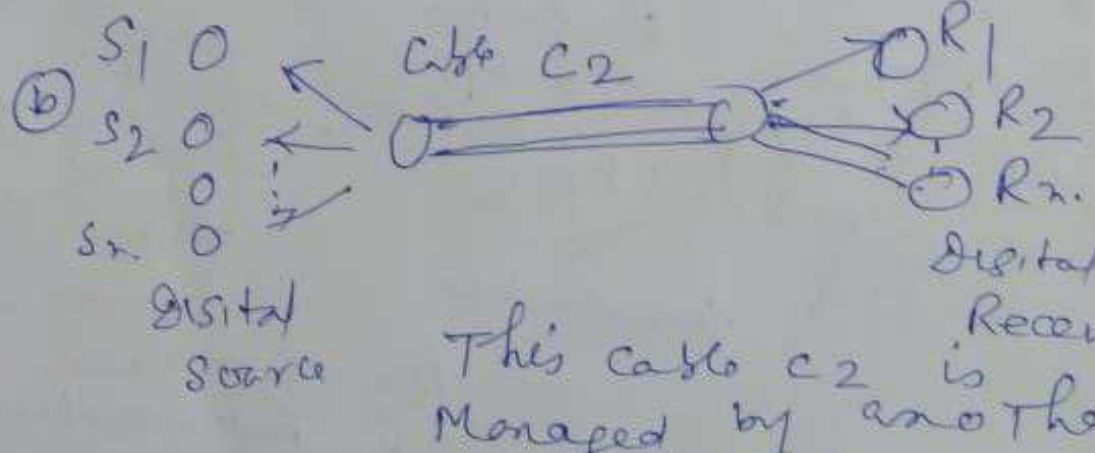
(a) Analog transmission
(b) Communication is digital.
(Enjoys all benefits of
Digital Communication
Except Digital
Regeneration)

This (V) shall be focus of our Learning for Digital Communication / Analog Transmissions over space.

For Digital communication over space why TDM is not possible.

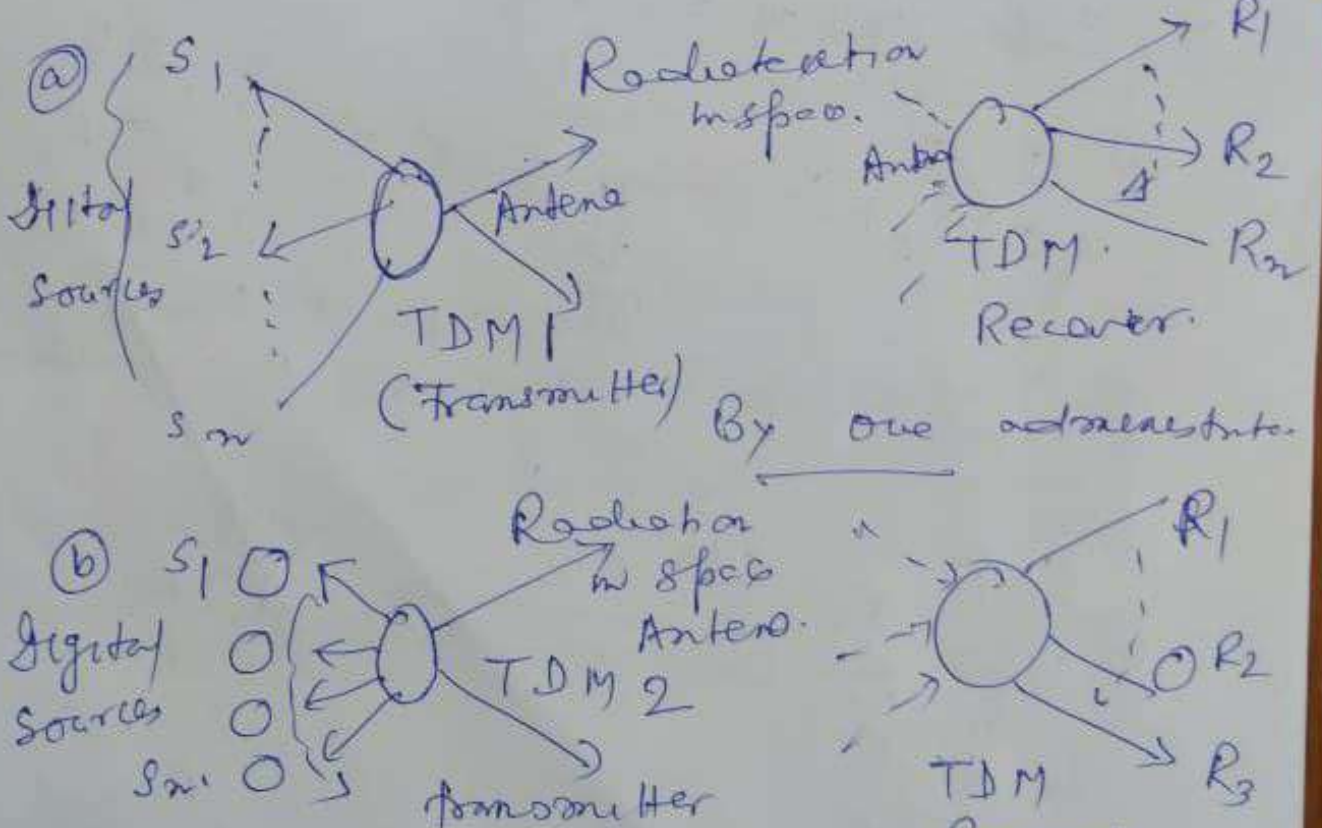
(i) Cable TDM ⇒ possible. ?





(c) No Radiation from Cable C_1 to C_2 or vice versa. Even they are kept at short distance.

(ii) Space TDM (Transmission of Multiple Digital source using Time Division multiplexing)



TDM1 one signal will interfere with TDM2 signal.