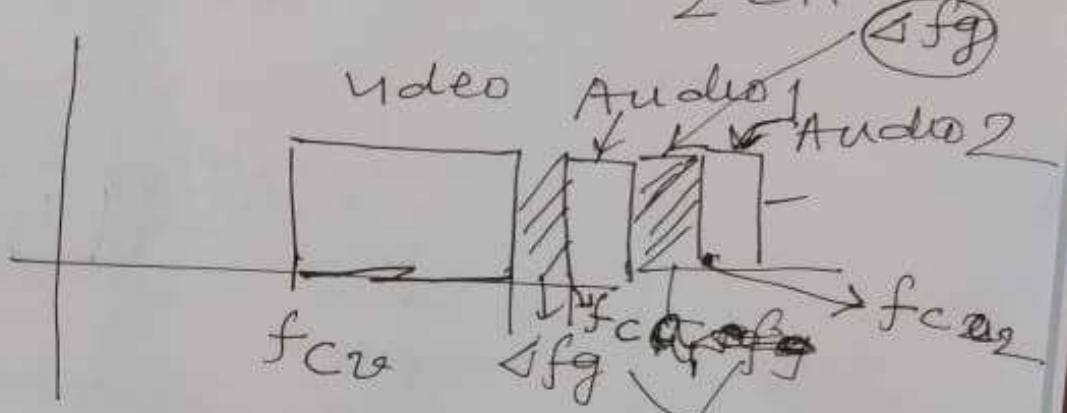
Page - 1. (A)

TV ~~Trans~~ Transmission

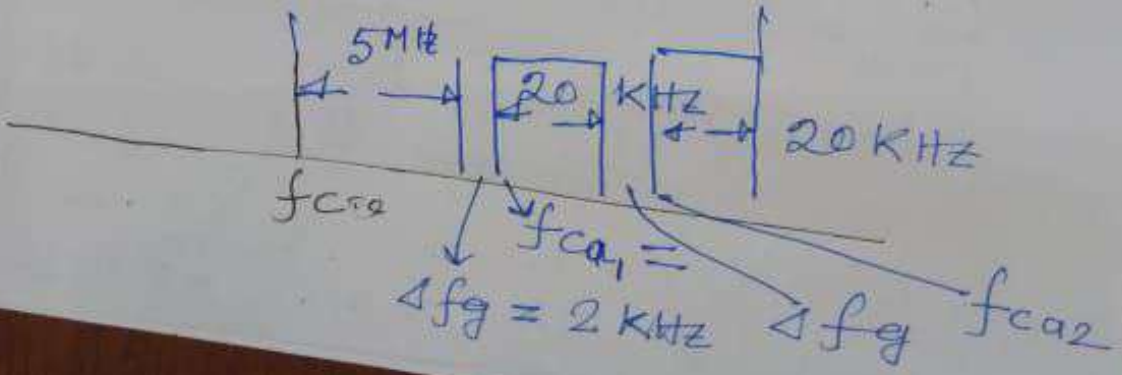
(1) TV signal — Video — 0 - 5 MHz
Audio — 0 - 20 KHz
Music

(2) TV Music ⇒ stereo
2 channels



f_{cv} = Carrier for Video
f_{ca_1} = Carrier for Audio channel 1
f_{ca_2} = Carrier for audio channel 2

(3) Assume both video and Audio music Amplitude Modulated



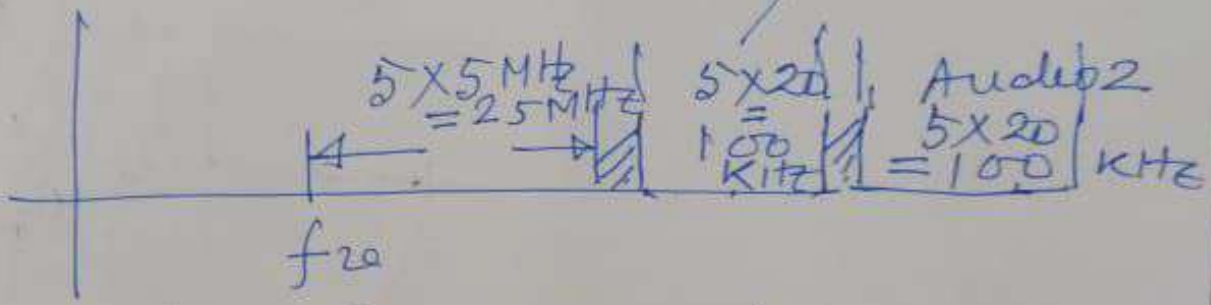
Neglecting guard Band

Total TV BW required

$= 5\,MHz + 2 \times 20\,KHz$

$= 5.040\,MHz.$

(4) Assume All Frequency Modulated Audio and Audio 1



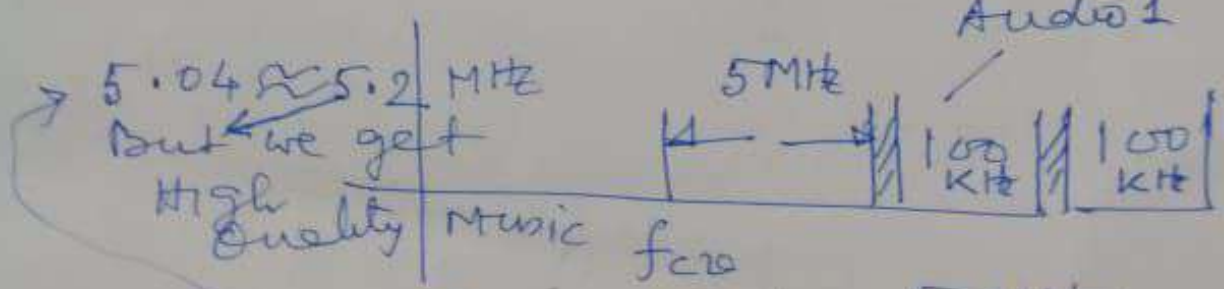
Total BW required

Required $= 25\,MHz + (100 + 100)\,KHz$

Because of very High channel BW $= 25.02\,MHz$

Video FM is discarded.

(5) Video AM and Audio FM



Total BW $= 5\,MHz + 200\,KHz$

$\approx 5.2\,MHz$

(6) For (3) $BW_{Total} = 5.04\,MHz$

For (5) $BW_{Total} = 5.2\,MHz$

→ Audio

1(c)

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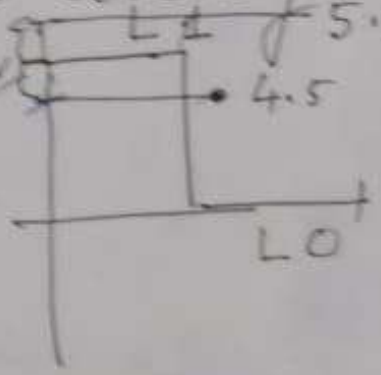
Analog vs Digital Transmission:

Quality of transmission of Digital signal is much better Than the analog signal + other benefits.

Why?

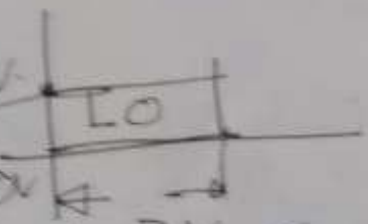
(1) Digital signal after some distance of propogation can be regenerated to its original form. which the ato analog signal is

(i) Range 5V to L1



L1 = 5V ± .5V (Logical 1)

(ii)

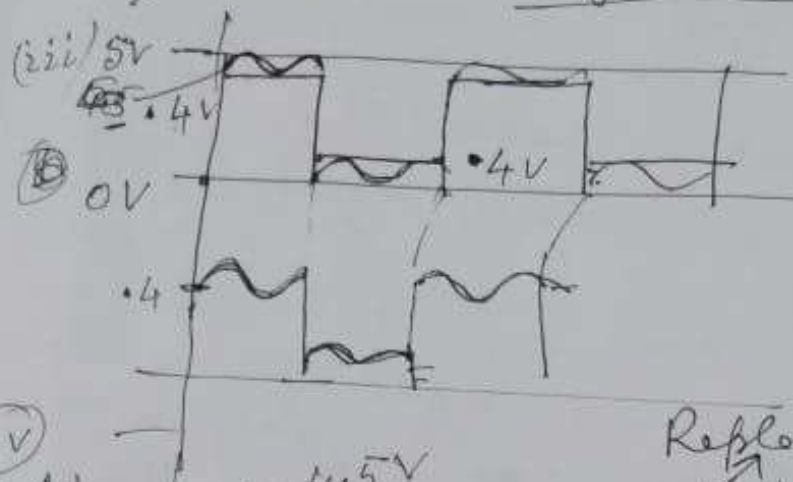


LO = 0 ± .5V

Suppose our transmission sequence is 1010...

L1 effected by -.4V negative noise

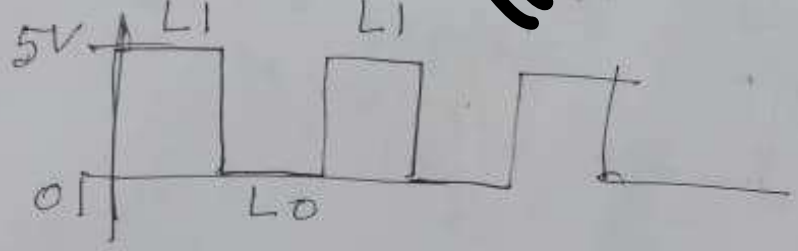
and LO effect +.4V noise (+ve noise)



(iv) At receiver ⇒ 4.5V ≤ Voltage ⇒ L1

Reflected by

Reflected Voltage ≤ ·5V ⇒ L0



(v) Then Amplified to compensate for power Loss.

Whole process is regeneration of digital signal

(2) (3) (4) Reshaping + Amplification

(vi) If the noise comes above ·5V and

(Part 03)

(i) If There is positive noise $> .5V$ Then 0's will be effected and signal can not be reshaped.

(ii) If Their is negative noise whose mod value $> .5V$ Then 1's will be effected

(iii) But Above (i) and (ii) will cause transmission error which can be taken care by digital transmission by error coding and retransmission Scheme.

Non of above can be taken care in Analog transmission.

(02) Digital Data can be stored and processed by Digital computer. This can not be done for analog signal or analog transmission.

(03) Due to above capability of digital computer the following can be done for only digital transmesion

(i) Data can be compressed to save transmesion bandwidth

- For example: digital music can be compressed using MP3 algorithm.

- Digital video can be compressed using MPEG 4 compression Algorithm

- This compression algorithms are lossy

  - Not suitable for computer data.
    - Banking
    - Student Record.
  - But suitable for video & music

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

(iii) To cop of transmission error:

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

(b) If so, Then There can be error recovery algorithm (like Stop & wait, sliding window) protocol of 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

(01) Digitization of voice:

If a signal has got maximum frequency ~~fmax~~ f_{sm} then according to Nyquist Interval Theorem.

No of Samples per second
$= 2 \times f_{sm}$

Each Sample is digitized using n bit / Sample.

So Total transmission Rate of Voice/Music = $2 \times f_{sm} \times n$

for telephonic voice $f_{sm} = 4$ kHz

$n = 8$ bit

Data rate for Telephonic voice
$= 4 \times 2 \times 8 = 64$ kbps

for Music $f_{sm} = 20$ kHz

$n = 16$ bit

∴ Data rate for Music $= \frac{20 \times 2 \times 16}{\text{for Mono Music}}$ kbps

For Stereo Music = 2 × Mono cha

Actually Music BW = 21.5 KHz
(NOT 20 KHz)

Calculate value of
$2 \times 21.5 \times 2 \times 16$ kbps
⇒ Uncompressed Stereo BW Music
⇒ MP3 compression 144 kbps

Video digitization

Digital Video Camera 1280 L

(HD Ready)

Today Aspect Ratio = B/L
$= \left(\frac{3}{4}\right) = \frac{9}{16}$

(Earlier Aspect Ratio $= \frac{3}{4}$

ne Screen
= one Frame = $1280 \times \frac{9}{720}$

one TV frame = 1280 × 720 × 24 bit

To bring continuity of motion picture 50 frames/sec.

Total Datarate able Digitization = 1280 × 720 × 24 × 50

Compressed by MPEG4 (MP4) = 2 to 6 Mbps

Variable bit Rate

(Classroom video = 2 Mbps

Horse Race over Mountain Range = 6 Mbps