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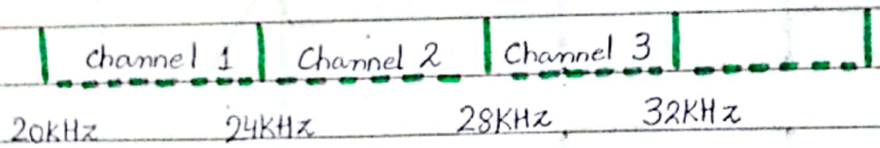
BSE-5B
02-131212-027

Date:

Q1) Assume that a voice channel occupies a bandwidth of 4kHz. We need to combine three voice channels into a link KHz. We need to combine three voice channels into the link with a bandwidth of 12KHz, from 20 to 32KHz. Show the configuration, using the frequency domain. Assume their configuration using the frequency domain - Assume there are no guard bands, here because the packet size is huge-

Given that each voice channel occupies a bandwidth of 4KHz, here is how we can arrange three channels within 20 to 32 KHz range:

Voice Channel 1: 20KHz to 24KHz
Voice Channel 2: 24KHz to 28KHz
Voice Channel 3: 28KHz to 32KHz



Q2) The AMPS uses two bands - The first band of 824 to 849 MHz is used for bands. The first band of 824 to 849 MHz is used for sending and 869 to 894 MHz is used for receiving. Each user has a bandwidth of 30KHz in each direction. Each user has a bandwidth of 30KHz in each direction. How many people can use their cellular phones simultaneously?

Sending Band = 824MHz to 849MHz
Receiving Band = 869 MHz to 894MHz.

For Sending Band:-

Sending Bandwidth = 849 - 824 = 25 MHz

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Dividing this by bandwidth per user (30KHz) :

$$= \frac{25\times10^6}{30\times10^3} = 833 \text{ users}$$

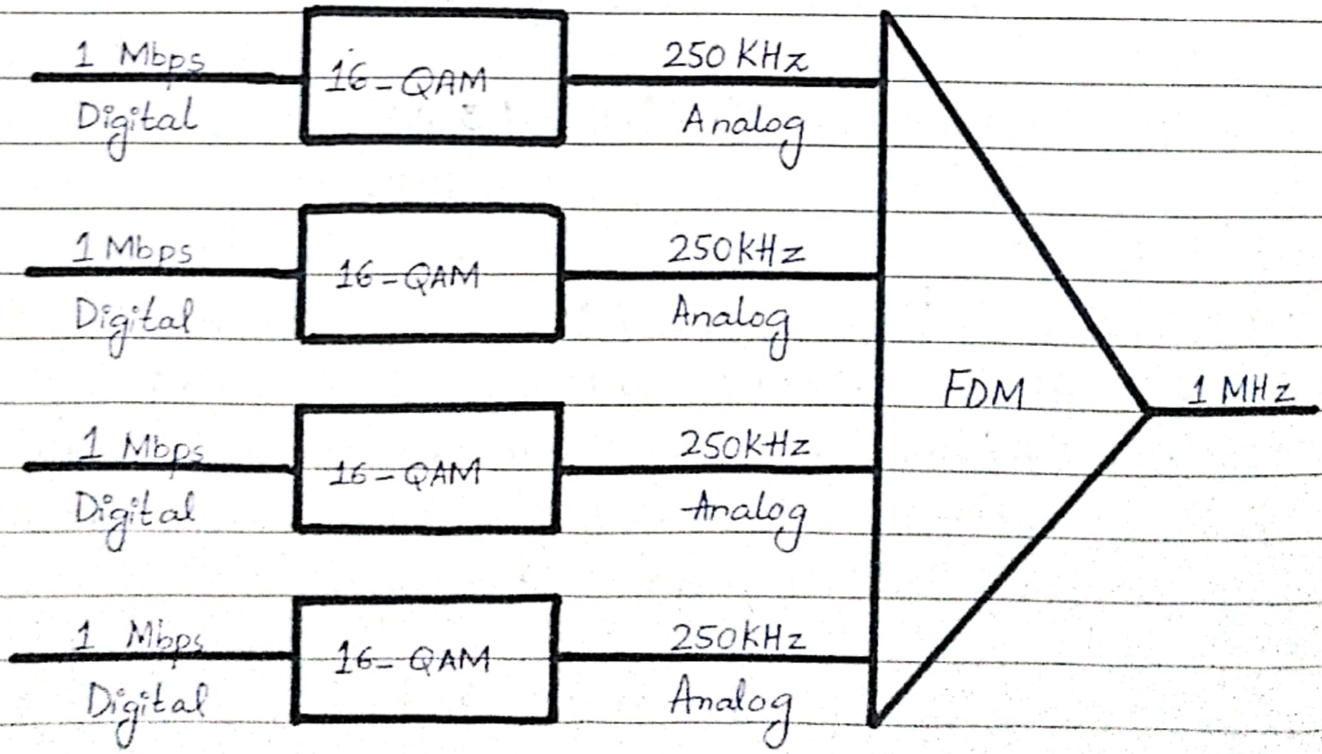
For Receiving Band :-

Receiving Bandwidth = 894 − 869 = 25 MHz

Dividing this by bandwidth per user (30KHz) :

$$= \frac{25\times10^6}{30\times10^3} = 833 \text{ users}$$

Q3) Four data channels (digital) each transmitting at 1 Four data channels (digital), each transmitting at 1 Mbps, use a satellite channel of 1 MHz. Design an appropriate configuration using FDM configuration, using FDM.



The satellite channel is analog

We divide it into four channels having 1MHz/4 = 250 KHZ bandwidth.

Assuming no noise we can use Nyquist to get:

$$C = 1\ \text{Mbps} = 2 \times 250 \times \log_2 L$$

$$1\ \text{Mbps} = 500 \times \log_2 L$$

$$\frac{1\cancel{000000}}{5\cancel{00000}} = \log_2 L$$

$$2 = \log_2 L$$

$$L = 2^2$$

$$L = 4$$

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Q4) Figure shows synchronous TDM with a data stream for each input and one data stream for the output. The ~~output~~ unit of data is 1 bit. Find (a) the input bit duration (b) the output bit duration. (c) the output bit rate (d) the output frame rate.

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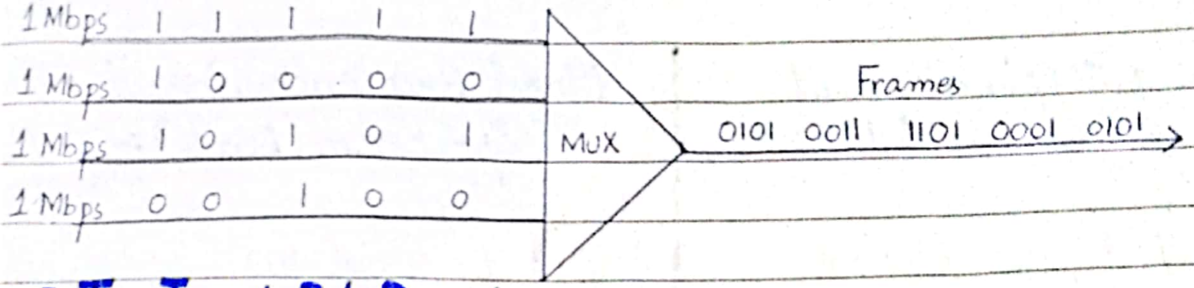

ⓐ The Input Bit Duration:-

The Input Bit Duration is the inverse of the bit rate :

$$\frac{1}{1\,\text{Mbps}} = \boxed{1\,\mu s}$$

ⓑ The Output Bit Duration:-

The output Bit Duration is the one-fourth of the input bit duration :

$$\frac{1}{4}(1\,\mu s) = \boxed{\frac{1}{4}\,\mu s}$$

ⓒ The Output Bit Rate:-

The output bit rate is the inverse of the output bit duration

$$\frac{1}{\frac{1}{4}\,\mu s} = 1 \div \frac{1}{4}\,\mu s = \boxed{4\,\text{Mbps}}$$

ⓓ The Output Frame Rate:-

The output frame rate is always the same as input rate.

$$\text{input rate} = \frac{1}{1\,\mu s} = 1\,\text{Mbps}$$

$$\text{Output Frame Rate} = \boxed{1000000 \text{ frames per second}}$$

Q5) D/f b/w FHSS and DSSS

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Frequency Hopping Spread Spectrum:- (FHSS)	Direct Sequence Spread Spectrum (DSSS):-
1) Rapidly hops between different frequency channels in a pseudorandom manner-	Spreads the signal over a wider bandwidth using a chipping code-
2) Uses multiple frequency channels, hopping between them at predefined intervals-	Utilizes a wider frequency band-
3) Occupies a narrowband for a short duration of time before hopping to another channel.	Occupies a wideband for the entire duration of transmission-
4) Good resistance to narrowband interference due to frequency hopping	Resists interference by spreading the signal over a wide bandwidth-
5) Provides relatively lower effective data rates-	Can achieve higher data rates-