Kafrelsheikh University
Faculty of Engineering
Department of Electrical Engineering
(Computers and Systems)

Time allowed: 3 Hours
Full mark: 70 Marks
Academic year: 2020-2021
Year: 3rd year

Subject: Digital Communications

Solve the following questions:-
Question One: (20 Marks)
Put (√) or (×) then correct the false one

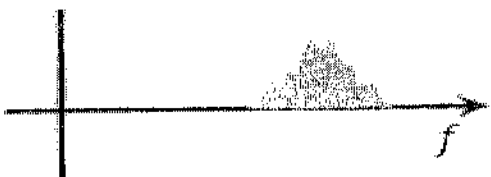|	
1-	Flat top sampling is similar to impulse sampling except that the impulse train is replaced by pulse train signal.
2-	Line coding is the process for converting digital signal into digital data.
3-	To demodulate a PWM or PPM signal, it is only required to pass the signal through low pass filter (LPF) and we can get the message signal in the output.
4-	The quantizing error consists of the difference between the analog signal at the sampler input and the output of the quantizer.
5-	In AM, modulation index is a dimension less factor, which measure the depth or degree of modulation.
6-	It is considered a perfect sampling which used to modulate a massage signal of frequency = 1 kHz by PAM system using a pulse generator of sample time =0.25 ms and the number of samples per cycle 2 samples.
7-	In synchronous transmission, we send one start bit (0) at the beginning and one or more stop bits (1) at the end of each byte.
8-	In AM the total power of the modulated signal is only the power in the two sidebands.
9-	There may be a gap between each byte in synchronous transmission.
10-	The μ law algorithm is a companding algorithm. Its purpose is to reduce the dynamic range of an audio signal.

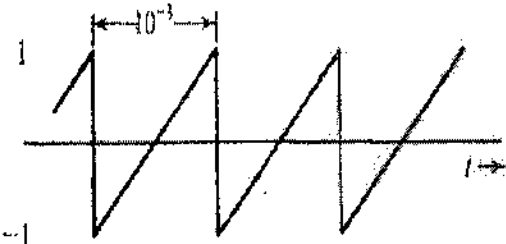**Question Two:** (10 marks)
Choose the correct answer:

1- In .... transmission, we send bits one after another without start / stop bits or gaps.   (a) Synchronous   (b) Asynchronous   (c) both of them

2- There are three main techniques used to implement the analog to digital converter, ... is considered the fast technique but requires more hardware than the other two methods.   (a) Counting Encoder   (b) Parallel Encoder   (c) Serial Encoder

3- In the counting encoder circuit used for ADC, when the value of the ramp becomes ....the sample value, the binary value of the counter is read.   (a) Greater than   (b) Equal to   (c) Less than

4- Non uniform quantization is practically achieved through a process called ....   (a) Expanding   (b) Companding   (c) Compression

5- The case of uniform quantization corresponds to a value of μ =.......... In μ- law companding.   (a) 0   (b) 1   (c) 2

6- The bandwidth of PCM depends on ....
(a) Bit rate   (b) Pulse shape   (c) Both of them

7- In .... wave modulation some parameters (amplitude, duration, position) of a carrier wave is varied continuously in accordance with the message signal.
(a) Continuous   (b) Pulse   (c) Both of them

8- The power efficiency in amplitude modulation using a tone modulation message .... as a modulation index increases.
(a) Increases   (b) Decreases   (c) Not affected

9- There are many categories of amplitude modulation the figure shown below describe the ....

(a) DSB-WC   (b) DSB-SC   (c) SSB

10- For the baseband signal m(t) shown below if $w_c = 2\pi \times 10^6$, $K_f = 2000\pi$, the minimum frequency of the resulting FM modulated signal = ...

(a) 999000Hz   (b) 1001000 Hz   (c) 10^7 Hz

Question Three: (20 Marks)

1- Assume that an analog voice frequency signal, which occupies a band from 300 to 3400 HZ, is to be transmitted over a $\mu=255$ law companded PCM system. Assume that each sample value is represented by 7 information bits plus 1 parity bit. Find the following:
   a)   Number of levels used in quantizer.
   b)   Bit rate.
   c)   Assume a code word of transmitted data in a certain time is 11001100 represent the digital signal using **Bipolar (RZ) Signaling.**
   d)   Bandwidth using this line code
   e)   The output SNR for this companded PCM system

2- Draw the block diagram of the Pulse code modulation system.

Question Four: (20 Marks)

1- A Modulating signal m(t) is a pure sinusoidal signal as m(t) =10 cos (w$_m$t), which modulated using AM modulation system corresponding to the modulation index μ=2.

(a) Find the amplitude and power of the carrier.

(b) Write the expression of the modulated AM signal.

(c) Sketch the AM signal.

(d) Find the sideband power.

(e) Find the power efficiency.

2- A single tone FM signal is:

$$\varphi_{FM}(t) = 10\left[\cos\left(2\pi(10^6)t + 8\sin(2\pi(10^3)t)\right)\right]$$

Determine the following:

(a)   The carrier frequency f$_c$.

(b)   The modulation index ß.

(c)   The peak frequency deviation Δf.

Best wishes
Dr. Amira El Attar

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