



**Subject: Data Communication Systems**

**Solve the following questions:-**

**(20 Marks)**

**Question One:**

**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 message 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 $\mu$ law algorithm is a companding algorithm. Its purpose is to reduce the dynamic range of an audio signal.   |

**(20 marks)**

**Question Two:**

**Choose the correct answer:**

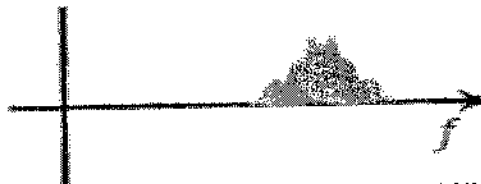
- |   |
|---|
| 1- In ..... transmission, we send bits one after another without start / stop bits or gaps.<br>(a) Synchronous                      (b) Asynchronous                      (c) both of them  |
| 2- There are three main techniques used to implement the analog to digital converter, ..... is considered the fast technique but requires more hardware than the other two methods.<br>(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.<br>(a) Greater than                      (b) Equal to                      (c) Less than  |
| 4- Non uniform quantization is practically achieved through a process called .....<br>(a) Expanding                      (b) Companding                      (c) Compression  |
| 5- The case of uniform quantization corresponds to a value of $\mu$ =..... In $\mu$ - law companding.<br>(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

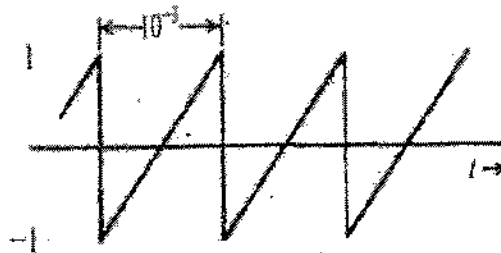
8- The power efficiency in amplitude modulation using a tone modulation message ..... as a modulation index increases.  
 (a) Increases (b) Decreased (c) Not affected

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  $\omega_c = 2\pi \times 10^6$ ,  $K_f = 2000\pi$ , the minimum frequency of the resulting FM modulated signal = .....



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

**Question Three:**

**(30 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.