



Name : .....  
Roll No. : .....  
Invigilator's Signature : .....

**CS/B.Tech (EIE/OLD)/SEM-6/EC-601(EI)/2013**

**2013**

**DIGITAL COMMUNICATION SYSTEM**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) The Gaussian Probability density is defined as

a)  $f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(x-m)^2/2\sigma^2}$

b)  $f(x) = \frac{1}{2\pi\sigma} e^{-(x-m)^2/2\sigma^2}$

c)  $f(x) = e^{-(x-m)^2/2\sigma^2}$

d)  $f(x) = \frac{1}{\sqrt{2\pi\sigma^2}}$

ii) Maximum quantization error in binary PCM is

a)  $\pm S/2$

b)  $\pm S$

c)  $\pm 2S$

d)  $\pm S/4$



- iii) PCM generation requires a LPF at the beginning because
- a) to eliminate aliasing effect
  - b) to eliminate quantization noise
  - c) to eliminate decoding noise
  - d) none of these.
- iv) The sensitivity of a system to timing error is determined by
- a) width
  - b) opening
  - c) rate of eye closure.
- v) The channel capacity of a white channel is given by
- a)  $C = B \log_2 (1 + S/N) \text{ b/S}$
  - b)  $C = B \log_2 (1 + \frac{N}{S}) \text{ b/S}$
  - c)  $C = NB \log_2 (1 + S/N) \text{ b/S} .$
- vi) Signal to Noise ratio for Integrate and Dump receiver is
- a)  $(S/N)_0 = \frac{A^2 T}{N_0 / 2}$
  - b)  $(S/N)_0 = \frac{A^2 T}{N_0}$
  - c)  $(S/N)_0 = \frac{4A^2 T}{N_0}$
  - d) none of these.



vii) Maximum signal to noise ratio for baseband receiver is

- a)  $(S/N)_0 = \frac{2E}{N_0}$                       b)  $(S/N)_0 = \frac{E}{N_0}$   
 c)  $(S/N)_0 = \frac{N_0}{E}$                       d) none of these.

viii) In QPSK the transmission BW required is ( $fb \rightarrow$  bit rate)

- a)  $fb$                                       b)  $2fb$   
 c)  $fb/2$                                   d)  $4fb$ .

ix) Sampling theory indicates which one of the following ?

- a)  $fs \geq w$   
 b)  $fs \leq 2w$   
 c)  $fs \geq 2w$ .

x) Bandwidth for BFSK signal is

- a)  $2 \times$  Bandwidth of BPSK  
 b)  $3 \times$  Bandwidth of BPSK  
 c)  $2 \times$  Bandwidth of BASK.

xi) In TI carrier system one frame duration equals

- a)  $128 \mu s$                               b)  $125 \mu s$   
 c)  $500 \mu s$                               d)  $800 \mu s$



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

2. a) Sketch the binary PSK waveform for the bit sequence 1101101.  
b) What is the difference between MSK and QPSK ? 2 + 3
3. a) What is Integrate and dump receiver ?  
b) Find its signal to noise ratio. 1 + 4
4. a) Explain the need for non-uniform quantization. What are the two laws associated with it ?  
b) For  $n$ -bit PCM system prove that signal to quantization noise ratio in dB is given by  $(S/N_q) = 1076 + 6.02n$  for a full scale sinusoidal modulating signal with amplitude  $V$  volts. 2 + 3
5. Draw the waveform for the following digital data : 10110101101
  - i) Bipolar NRZ
  - ii) Polar NRZ.
  - iii) Unipolar RZ
  - iv) Polar Quaternary NRZ format
  - v) Manchester format.



6. Into the PCM techniques, there are 512 levels and base band signal frequency is 3 kHz. Then find

- a) Sampling frequency
- b) Word length.

**GROUP – C**

**( Long Answer Type Questions )**

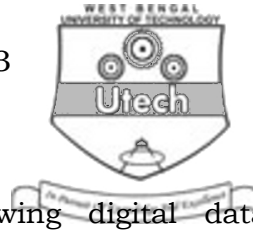
Answer any *three* of the following.  $3 \times 15 = 45$

7. a) What is optimum filter ?  
b) Calculate its probability of error and transfer function.  
c) Determine impulse response for the matched filter.

$2 + 9 + 4$

8. a) Draw and Explain block diagram of transmitter and receiver of a Adaptive Delta Modulator.  
b) A Delta Modulation system is designed to operate at 4 times the Nyquist rate for a signal with a 4 kHz bandwidth. The quantizing step size is 250 mV.  
i) Determine the maximum output of a 1 kHz input sinusoid for which the DM does not show slope overload.  
ii) Determine the post filtered output signal-to-quantization noise ratio for the above signal.

$9 + 3 + 3$



9. a) Draw the waveform for the following digital data

110111001011 in

- i) Unipolar RZ
  - ii) Polar NRZ
  - iii) Bipolar RZ
  - iv) Manchester Coding.
- b) Briefly describe frequency hop spread spectrum.
- c) Briefly describe Nyquist sampling theory applied for PCM.  $(4 \times 2) + 4 + 3$

10. a) Distinguish between GSM and CDMA mobile systems.
- b) Derive an expression for linear predictive coder.
- c) What do you understand by pulse stuffing and word stuffing ?  $5 + 5 + 5$



11. Write short notes on any three of the following : 3 x 5

- a) Sectoring of a BTS in mobile communication.
- b) Advantages and disadvantages of TDM and FDM systems.
- c) Walsh Coding in CDMA mobile system.
- d) DPSK Modulation.

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