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 : $10 \times 1 = 10$

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) $C = B \log_2 (1 + S/N)\ b/S$

b) $C = B \log_2 (1 + \frac{N}{S})\ b/S$

c) $C = NB \log_2 (1 + S/N)\ b/S$.

vi) Signal to Noise ratio for Integrate and Dump receiver is

a) $(S/N)_0 = \frac{A^2T}{N_0/2}$ b) $(S/N)_0 = \frac{A^2T}{N_0}$

c) $(S/N)_0 = \frac{4A^2T}{N_0}$ 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 × Bandwidth of BPSK

b) 3 × Bandwidth of BPSK

c) 2 × Bandwidth of BASK.

xi) In TI carrier system one frame duration equals

a) 128 μs b) 125 μs

c) 500 μs d) 800 μs

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

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 $(S/Nq) = 1076 + 6{\cdot}02n$ 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, their 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 : 3×5

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.