Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EIE)/SEM-6/EC-601(EI)/2012

2012

DIGITAL COMMUNICATION

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) To avoid slope overload in delta modulation the maximum value of signal amplitude will be

   a) $S f_s$ b) $W f_s$

   c) $S f_s / W$ d) f_s / W.

   where s = step size f_s = sampling frequency W = signal frequency.

   ii) If the frequency of the baseband signal is B Hz then it will be the minimum sampling rate

   a) 2B b) 3B

   c) B d) B/2.

iii) ADM involves additional hardware designed to provide variable step size

a) reducing slope overload effect

b) reducing granular noise

c) reducing quantization noise

d) none of these.

iv) Measure of information $I\left(m_k\right)$ of a message m_k with probability P_k is given by

a) $\log_b(1/P_k)$ b) $\log_b(P_k)$

c) $\log_b(1/P_k)$ d) $\log_b(1/1\text{-}P_k)$.

v) In TI carrier system one frame duration equals

a) 128 μs b) 125 μs

c) 500 μs d) 800 μs.

vi) Higher degree of uncertainty means

a) lesser information

b) more information

c) zero information

d) none of these.

vii) In a PCM system, the quantization noise depends upon

a) no. of quantization levels only

b) the sampling rate

c) both the sampling rate and no. of quantization levels

d) none of these.

viii) In a Delta modulation system, the granular noise occurs when the modulating signal

a) increases rapidly

b) remain constant

c) decreases rapidly

d) none of these.

ix) 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.

x) In vestigial spectrum the range of roll of factor is

a) $1 < r < 0$

b) $0 < r < 1$

c) $0 < r < \infty$.

xi) The sensitivity of a system to timing error is determined by

a) width

b) opening

c) rate of eye closer of the eye diagram.

xii) In QPSK the transmission bandwidth required is

a) f_b

b) $2f_b$

c) $f_b / 2$

d) $4f_b$ f_b -> Bit frequency.

GROUP – B

(Short Answer Type Questions)

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

2. A television signal having a BW of 4.2 MHz is transmitted using binary PCM system. Number of quantization level used is 512. Determine

   a) Code word length

   b) Transmission bandwith

   c) Output signal to quantization ratio. 1 + 2 + 2

3. Prove that the output of SNR of a matched filters is $8E_s/\eta$, where E_s is the signal energy and $G_n(f) = \eta/2$ of white Gaussian noise. Hence find the probability of error of it.

4. Draw ASK, FSK, PSK signal to transmit data stream 1111000111. What is complementary error function ?

   $3\frac{1}{2} + 1\frac{1}{2}$

5. What do you mean by Cross-talk ? How it can be overcome ? 2 + 3

6. a) Find the Nyquist rate and Nyquist interval for the following signal :

   $X(t) = 1/2\pi \cos(4000\,\pi t)\cos(1000\,\pi t)$.

   b) What do you mean by pulse detection error ? Why we are using regenerative repeater ? 3 + 2

7. What do you mean by Aliasing effect ?

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) What is the difference between uniform and non-uniform quantizer ? What is the necessity of non-uniform quantizer ? Explain companding.

   b) For an '*n*' bit PCM system prove that signal to noise ratio in dB is given by

   $(S/N9)\ dB = 1{\cdot}76 + 6{\cdot}02\ n$

   for a full scale modulating signal with amplitude '*V*' volts.

   c) What is the disadvantage of delta modulation ? What method is used to overcome the problem which arises in delta modulation ?

   d) Draw and explain the block diagram of transmitter and receiver of a delta modulator ?

   [(1 + 2) + 3 + (2 + 1) + 6]

9. a) What do you mean by coherent and non-coherent reception ?

   b) Explain detection of QPSK with proper diagram.

   c) Mention advantages of QPSK modulation technique.

   d) Discuss the requirement of bit synchronization and frame synchronization in digital communication system.

   3 + 7 + 2 + 3

10. a) Why pulse shaping is required in digital communication ?

    b) What is the Nyquist criterion for zero ISI ?

    c) Explain partial response signaling.

    d) What is the information obtained from eye pattern ?

3 + 4 + 4 + 4

11. a) What is a optimum filter ?

    b) Find the transfer function of optimum filter.

    c) Define matched filter

    d) Find the error probability of the matched filter.

2 + 5 + 2 + 6

12. Write short notes on any *three* of the following : 3 × 5

    a) CDMA

    b) Equalizer

    c) Integrate & Dump Filter

    d) Linear Block Code

    e) Differential Encoding.