Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/ECE/New/SEM-6/EC-601/2013

2013

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) A random variable is determined by a large number of independent events that tends to have a Gaussian probability distribution. This can be described using

a) Central limit theorem

b) Superposition

c) Convolution

d) Correlation.

ii) An ergodic random process is one which has the property that

a) ensemble average is constant

b) time average varies with time

c) ensemble average constant but time average varies with time

d) ensemble average and time average are equal.

iii) The main advantage of PCM system is

a) possibility of TDM

b) less channel bandwidth

c) less transmission power

d) better noise performance.

iv) To avoid aliasing, what is the Nyquist rate of the signal $x(t) = 8 \cos(200 \pi t)$?

a) 50 Hz b) 100 Hz

c) 200 Hz d) 400 Hz.

v) The use of non-uniform quantization leads to

a) reduction to transmission BW

b) increase in maximum SNR

c) increase in SNR for low level signals

d) simplification of quantization process.

vi) Regenerative repeaters can be used in

a) analog communication system only

b) digital communication system only

c) analog & digital communication systems

d) none of these.

vii) The spectral density of white noise is

a) Exponential b) Uniform

c) Poisson d) Gaussian.

viii) Adaptive delta modulation is preferred over delta moldulation as

a) it gives better noise performance

b) it uses lesser bits for encoding the signal

c) it does not suffer from slope overload and threshold effect

d) it has simpler circuitry.

ix) For generation of FSK the data pattern must be given in

a) RZ format

b) NRZ format

c) Split phase Manchester

d) none of these.

x) Which of the digital modulation techniques is used for high speed telephone modems ?

a) QAM b) GMSK

c) QPSK d) GFSK.

xi) The bit rate of a digital communication system is 34 Mpbs. The modulation scheme is QPSK. The baud rate of the system is

a) 68 Mbps b) 34 Mbps

c) 17 Mbps d) 85 Mbps.

xii) Eye pattern is used to study

a) ISI b) Quantization noise

c) Error rate d) None of these.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. State the reason of importance of Gaussian random variable. What is error function ? 2 + 3

3. Write down sampling theorem. Discuss different methods of sampling. 2 + 3

4. For the data bit 10110001, draw the waveforms for ASK, FSK, PSK, QPSK.

5. How is orthogonality of two signals defined ? Explain the term 'norm of the signal' ? What is physical significance ? 2 + 2 + 1

6. What is quantization error ? How does it depend upon the step size ? Suggest some methods to overcome the difficulties encountered when the modulating signal amplitude swing is very large. 1 + 2 + 2

GROUP – C
(Long Answer Type Questions)

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

7. a) What is conditional probability ?

   b) Differentiate between random variable and random process with suitable example.

   c) State Central limit theorem.

   d) Prove the Gram-Schmidt orthogonalization procedure.

   e) Discuss the property of auto-correlation functions.

   2 + 3 + 2 + 5 + 3

8. a) With neat block diagram, explain the generation & reception of Delta Modulation (DM).

   b) What are the limitations of DM ? How these can be solved ?

   c) For a sinusoidal signal (A cos ωt), find the condition for no slope overload, if step size is Δ & sampling period is Ts. 6 + (3 + 2) + 4

9. a) Draw the block diagram of a QPSK transmitter and receiver and explain the generation of QPSK signal. Show its State Space Representation.

   b) Compare the bandwidth and probability of error of 16 MPSK with QASK.

   c) List the advantages and disadvantages of DPSK Modulation technique. 2 + 5 + 2 + 3 + 3

10. a) What is Nyquist criterion for Inter-symbol interference ?

    b) What are the limitations of ideal solution and how it can be solved with the help of Raised Cosine Function ?

    c) Write a short note on zero forcing equalizer. 5 + 5 + 5

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

    a) Matched filter

    b) Adaptive delta modulator

    c) Pulse time modulation

    d) Regenerative repeater

    e) Eye pattern.