



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.

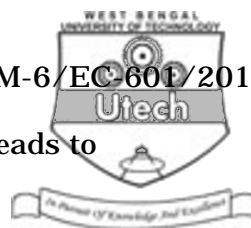
iii) The main advantage of PCM system is

- 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

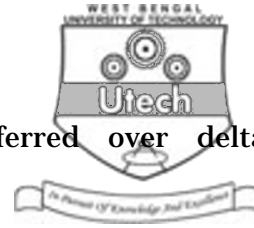
- a) reduction to transmission BW
- b) increase in maximum SNR
- c) increase in SNR for low level signals
- d) simplification of quantization process.

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

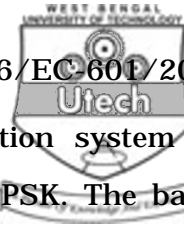
- a) Exponential
- b) Uniform
- c) Poisson
- d) Gaussian.



viii) Adaptive delta modulation is preferred over delta modulation 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 Mbps. 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. $3 \times 15 = 45$

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 ($A \cos \omega t$), find the condition for no slope overload, if step size is Δ & sampling period is T_s .

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.
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