



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ECE)/SEM-5/EC-502/2011-12

2011

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.

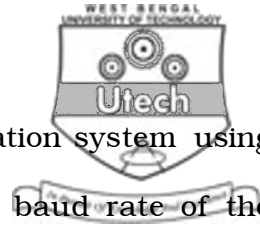
GROUP – A

(Multiple Choice Type Questions)

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

10 × 1 = 10

- i) Eye pattern is used to study
 - a) Bit Error Rate
 - b) Error Vector Magnitude
 - c) Quantization Noise
 - d) Inter Symbol Interference.



ii) The bit rate of a digital communication system using QPSK modulation is 30 Mbps. The baud rate of the system will be

- a) 60 Mbps b) 15 Mbps
- c) 30 Mbps d) 7.5 Mbps.

iii) The number of bits required to represent a 256 level quantization in PCM is

- a) 7 b) 8
- c) 5 d) 6.

iv) In PCM, the amplitude levels are transmitted in a 7 unit channel code. The sampling is done at the rate of 10 Hz. The bandwidth preferred minimum should be

- a) 5 kHz b) 35 kHz
- c) 70 kHz d) 85 kHz.

v) Hamming distance between two code vectors $x = (10101101)$ and $y = (11011001)$ is

- a) 2 b) 3
- c) 5 d) 4.



vi) 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 effects
- d) It has simpler circuitry.

vii) If the maximum instantaneous phase transition of a digital modulation technique is 90° , the modulation will be recognised as

- a) DPSK
- b) QPSK
- c) OQPSK
- d) BPSK.

viii) For (7, 4) linear block code, the length of check bits is given by

- a) 1
- b) 4
- c) 3
- d) 7.

ix) Spread spectrum technique is used to increase

- a) Power efficiency
- b) Processing gain
- c) Spectral efficiency
- d) Transmission gain.



- x) Alternate Mark Inversion (AMI) signaling is known as
- a) Bipolar signaling
 - b) Polar signaling
 - c) Manchester signaling
 - d) Unipolar signaling.
- xi) Regenerative repeaters can be used in
- a) Analog communication system only
 - b) Digital communication system only
 - c) Both analog and digital communication systems
 - d) Wireless communication only.
- xii) For encoding the binary data, the Differential encoding uses
- a) signal transitions
 - b) signal frequency
 - c) signal amplitude
 - d) signal phase.

GROUP – B

(Short Answer Type Questions)

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

2. Draw the line codes corresponding to the binary data "1101001" for the following :
- $1 \frac{1}{2} + 1 \frac{1}{2} + 2$
- a) Unipolar Nonreturn to zero
 - b) Polar Nonreturn to zero
 - c) Manchester coding.



3. Generate the pn -sequence "1110010" using a three-stage Linear Feedback Shift Register (LFSR). 5
4. Draw the block diagram of a QPSK modulator and explain its principle of operation. 5
5. A discrete memoryless source X has five symbols $x_1, (I = 1, \dots, 5)$ with $p(x_1) = 0.4, p(x_2) = 0.19, p(x_3) = 0.13, p(x_4) = 0.16, p(x_5) = 0.12$. Construct the Huffman code for x and calculate the efficiency of the code. 5
6. Draw an "Eye diagram" and mention the significance of its different parts. 5

GROUP – C

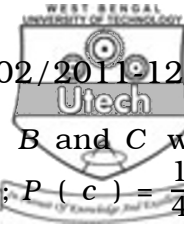
(Long Answer Type Questions)

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

7. a) State Nyquist's criterion for zero Inter Symbol Interference (ISI). 4
- b) Mention the limitations of the above criterion. 3
- c) How can the above problems be solved by using a Raised cosine function. 4
- d) A communication channel of bandwidth 50 khz is required to transmit binary data at the rate of 500 kbps using Raised cosine pulse. Determine the corresponding roll-off factor. 4



8. a) What are the salient features of spread spectrum ? 2
- b) With a neat block diagram, explain the principle of Direct Sequence Spread Spectrum (DSSS) transmitter and receiver. 8
- c) Define processing gain. 2
- d) A spread spectrum system has the following parameters:
- Message bit rate = 3 kbps
- pn -sequence chip rate = 3.072×10^6
- Find processing gain. 3
9. a) Compare QPSK and OQPSK systems with respect to the following factors : 3 × 4
- i) Timing diagram
- ii) I - Q diagram
- iii) Non-linearity handling capability.
- b) Compare the bandwidth efficiency of a BPSK system and a QPSK system. 3
10. a) What do you mean by an optimum filter ? When is it called matched filter ? 3 + 3
- b) Find the probability of error of the matched filter. 9



11. a) A source produces three symbols A, B and C with probabilities $P(A) = \frac{1}{2}$; $P(B) = \frac{1}{4}$; $P(C) = \frac{1}{4}$.

Calculate source entropy.

5

- b) i) Find the transmitted code word for the data "101".

The generator matrix is given below :

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

- ii) Find the correct code word if the receiver receives

101101. (Consider same generator matrix) 5 + 5

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

- a) Shannon's channel capacity
- b) Adaptive delta modulation
- c) Tapped delay equalizer
- d) Companding
- e) Differential encoding.

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