



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH (CSE(IT)NEW) / SEM-4 / CS-401 / 2012

2012

COMMUNICATION ENGINEERING AND CODING THEORY

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 the following :

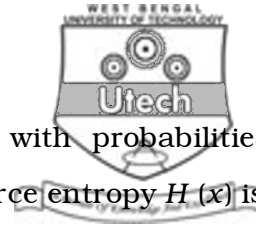
10 × 1 = 10

i) Intermediate frequency of standard AM receiver system is

- a) 500 kHz
- b) 555 kHz
- c) 455 kHz
- d) 450 kHz

ii) An analog signal is quantized using L levels, the signal to quantization noise ratio varies

- a) directly with L
- b) directly with L^2
- c) directly with L^3
- d) none of these.



iii) If a source produces five symbols with probabilities $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$ and $\frac{1}{16}$, then the source entropy $H(x)$ is

- a) 3 b/symbols b) 5.5 b/symbols
c) 2.875 b/symbols d) 1.875 b/symbols.

iv) If maximum frequency present in one TDM signals is f_m , then for proper detection the message signals sampling rate f_s should follow the relation

- a) $f_s = f_m$ b) $f_s > f_m$
c) $f_s = 2f_m$ d) $f_s \geq 2f_m$.

v) Maximum efficiency in AM is

- a) 25% b) 50%
c) 33% d) 83%.

vi) Efficiency of coding will be maximum when average code length (L) and entropy [$H(m)$] is

- a) $L = H(m)$ b) $L > H(m)$
c) $(L < H(m))$ d) none of these.



- vii) If a signal band - limited f_m Hz is sampled at a rate less than $2f_m$ the reconstructed signal will be
- a) Smaller in magnitude
 - b) Higher in magnitude
 - c) Have higher frequency suppressed.
 - d) Distorted.
- viii) If the step size of quantization in PCM is 36 mv, the quantization noise is
- a) $36 \mu w$
 - b) $72 \mu w$
 - c) $108 \mu w$
 - d) $18 \mu w$.
- ix) In law μ -law compression, $\mu=0$ corresponds to
- a) Non-uniform quantization
 - b) No quantization
 - c) Better S/N ratio
 - d) Uniform quantization.
- x) The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
- a) unchanged
 - b) halved
 - c) doubled
 - d) increased by 50 per cent.



GROUP – B

(Short Answer Type Questions)

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

2. What is companding used in PM ? Mention μ -law and A-law.
2 + 3
3. Explain the principle of ISI and Nyquist criterion for distortionless base-band binary transmission. 3 + 2
4. Explain natural and flat-top sampling. What do you mean by aliasing effect ? 2 + 2 + 1
5. Define information and average information. A source produces four symbols with probabilities 0.5, 0.25, 0.125 and 0.125. Calculate the source entropy. 2 + 3
6. Explain the coherent and non-coherent detection of BFSK signal. 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain the working principle of envelope detector.
b) What do you mean by synchronous detection ? What is pilot carrier transmission ?



- c) Determine the power content of the carrier and each of the side bands for an AM signal with $m = 0.8$ and total power of 2500 W. 5 + 3 + 2 + 5
8. a) Show that we may generate FM signal using phase modulator and vice versa .
- b) Starting from the expression of WBFM derive the expression of NBFM.
- c) A carrier is frequency modulated by a sinusoid modulating signal of frequency 15 kHz resulting in a frequency deviation of 75 kHz. What is the bandwidth occupied ?
9. a) Define random error and burst error ? 2
- b) A (6, 3) linear block code is generated according to the generator matrix

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



For a particular code word transmitted, the received code word is 100011. Find the corresponding data transmitted. 6

c) What is QPSK ? Explain a QPSK modulator. 5

d) What is Cyclic Redundancy Check (CRC) for error detection ? 2

10. a) Explain the term entropy. 4

b) A source produces 4 symbols A, B, C and D with probabilities $\frac{1}{6}, \frac{1}{3}, \frac{1}{4}, \frac{1}{4}$.

Find entropy of the source. 4

c) What is meant by channel capacity ? How is it dependent on SNR ? 4

d) Encode the bit sequence 0100101 in the following form :

(i) Unipolar NRZ

(ii) Bipolar RZ

(iii) AMI RZ. 3



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

- a) Shanon-Franco algorithm for encoding
- b) Manchester coding
- c) Companding
- d) Carson's rule
- e) Adaptive deltamodulation.

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