

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 :

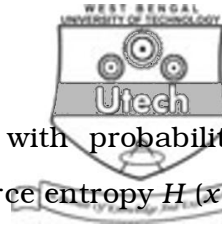
10 × 1 = 10

- 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.

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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)  $3 \text{ b/symbols}$                       b)  $5.5 \text{ b/symbols}$   
 c)  $2.875 \text{ b/symbols}$                 d)  $1.875 \text{ b/symbols}$ .

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.

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- 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  $\mu$ -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.

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**GROUP – B****( Short Answer Type Questions )**Answer any *three* of the following.  $3 \times 5 = 15$ 

2. What is companding used in PM ? Mention  $\mu$ -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 ?

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- 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

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

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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

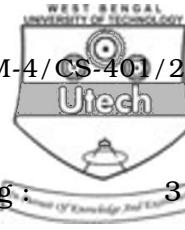
d) Encode the bit sequence 0100101 in the following form :

(i) Unipolar NRZ

(ii) Bipolar RZ

(iii) AMI RZ. 3

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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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