Code No: R05220503 **Set No. 1**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2008
PRINCIPLES OF COMMUNICATIONS
(Common to Computer Science & Engineering, Bio-Medical Engineering, Information Technology, Computer Science & Systems Engineering and Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the limitations of Fourier Transform?
   (b) State and explain the Dirichlet conditions, in Fourier series. [8+8]

2. In a collector-modulated class C amplifier, the collector dissipation is 60 watts. The amplifier efficiency is 80%. Find the unmodulated carrier power if the depth of modulation is 70%. [16]

3. A carrier is frequency-modulated by a sinusoidal modulating signal of frequency 2 kHz, resulting in a frequency deviation of 5 kHz. What is the bandwidth occupied by the modulated waveform? The amplitude of the modulating sinusoid is increased by a factor of 3 and its frequency lowered to 1 kHz. What is the new bandwidth? [16]

4. Explain the signal recovery through holding. [16]

5. (a) Discuss the performance of adaptive delta modulation compared to that of PCM.
   (b) Discuss the limitations of delta-modulation due to fixed step size. [10+6]

6. (a) Differentiate BPSK & QPSK
   (b) Define
      i. Baud Rate
      ii. Matched Filter
      iii. Band width efficiency.
      iv. SNR. [8+8]

7. (a) Show that for a two dimensional discrete finite probability scheme the joint conditional and marginal entropies are related as
   $$H(x,y) = H(x/y) + H(y) \\ +H(y/x) + H(x)$$
   Also $I(x,y) = H(y) - H(y/x)$.
   (b) An analog signal is band limited to B Hz, sampled at the Niquist rate into 4 levels. The quantization levels Q_1, Q_2, Q_2 and Q_4 (messages) are assumed independent and occur with probabilities $P_1 = P_4 = 1/8$ *and* $P_2 = P_3 = 3/8$.. Find the information rate of the source. [10+6]

8. (a) Construct the standard array for a (6, 3) linear block code whose generator matrix is given below. $G = \begin{vmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{vmatrix}$

   (b) Write the advantages of table lookup decoding scheme in linear block codes. [10+6]

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Code No: R05220503 **Set No. 2**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2008
PRINCIPLES OF COMMUNICATIONS
(Common to Computer Science & Engineering, Bio-Medical Engineering, Information Technology, Computer Science & Systems Engineering and Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the highest value of auto correlation of a function f(t), where f(t) = 2cost + 3cos3t + 4 sin4t. [16]

2. Define amplitude modulation. The rms value of a radio frequency voltage is 200 volts before modulation. When it is modulated by a sinusoidal audio frequency voltage, its rms voltage becomes 242 volts. Calculate the modulation index. [16]

3. A bandwidth rule sometimes used for space communication systems is $\beta = (2\ \beta + 1)f_m$. What fraction of the signal power is included in that frequency band. Consider β =1 and 10. [16]

4. A function f(t) = sinω_ct is sampled at Nyquist rate. If the sampling starts from a zero crossing; can we recover f(t) from its samples? [16]

5. (a) What do you understand by PCM? How quantizing and coding are done?
   (b) What is aliasing effect and aperture effect. How these effects can be overcome. [8+8]

6. (a) Differentiate BPSK & QPSK
   (b) Define
      i. Baud Rate
      ii. Matched Filter
      iii. Band width efficiency.
      iv. SNR. [8+8]

7. (a) What is the significance of coding? Explain the principles of any one type of source code.
   (b) Derive expression for channel capacity for infinite bandwidth.
   (c) A source is delivering 3 messages with probabilities 1/2, 1/4, 1/4 What is the entropy of second order source. [6+6+4]

8. (a) Construct the standard array for a (6, 3) linear block code whose generator matrix is given below. $G = \left|\begin{array}{cccccc} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{array}\right|$

(b) Write the advantages of table lookup decoding scheme in linear block codes. [10+6]

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Code No: R05220503 **Set No. 3**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2008
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the types of communications? Explain.
   (b) Define noise. Where is it most likely to affect the signal? [8+8]

2. The signal v(t) = (1 + m cosω_m t)cosω_ct is detected using a diode envelope detector. Sketch the detector output when m = 2. [16]

3. Give the relationship between phase and frequency modulation. [16]

4. State and prove the sampling theorem (frequency domain). [16]

5. (a) What are the applications of PCM systems give in detail any two applications?
   (b) Explain why is it necessary to use greater sampling rate for DM than for PCM? [10+6]

6. (a) Explain DPSK modulator and DPSK demodulator with block diagram and differential encoding and decoding tables.
   (b) Distinguish between ASK and PSK modulation systems. [12+4]

7. (a) Consider a binary memory less source X with two symbols X_1 and X_2. Show that H(X) is maximum when both X_1 and X_2 are equiprobable.
   (b) A Channel has the following channel matrix:
   $[P(Y|X)] = \begin{bmatrix} 1-p & p & 0 \\ 0 & p & 1-p \end{bmatrix}$
      i. Draw the channel Diagram
      ii. If the source has equally lightly outputs compute the probabilities associated with the channel outputs for p=0.2. [8+8]

8. (a) Write explaining notes on Turbo codes and BCH codes
   (b) Design an encoder for a (7,4) binary cyclic code generated by g(x)=1+x+x^3 and verify its operation using the message vector D=0101. [8+8]

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Code No: R05220503 **Set No. 4**

II B.Tech II Semester Supplimentary Examinations, Aug/Sep 2008
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Compare the Autocorrelation and Cross correlation.
   (b) Derive the modulation theorem using FT. [8+8]
2. Find the various frequency components and their amplitudes in the voltage given below. e= 50(1 + 0.7 cos 5000t - 0.3cos1000t) sin 5×10^6 t. Draw the single sided-spectrum. Also evaluate the modulated and sideband powers. [16]
3. A carrier voltage 10 cos $8\pi 10^6$t is angle modulated by a modulating signal 5 cos $30\pi.10^3$t. Determine the bandwidth for frequency modulation assuming $k_f = 15$ kHz per volt. [16]
4. Give the importance of sampling theorem in communication. [16]
5. (a) Compare the advantages and disadvantages of DM and PCM.
   (b) Describe the techniques used for parallel transmission and serial transmission. [8+8]
6. (a) What is m-ary FSK scheme and derive the average probability of error for coherent m-ary FSK.
   (b) Distinguish between QPSK and MSK. [8+8]
7. (a) Define and discuss
      i. Mutual information
      ii. Average information.
      iii. Channel matrix
   (b) What are the characteristic features of Shannon?s theorem and Shannon-Hartley law? [9+7]
8. (a) Write a short notes on the following
      i. Parity check matrix
      ii. code tree in convolutional codes
   (b) In a communication channel encoder, every data bit is repeated five times, and at the receiver, a majority vote decides the value of each data bit. If the uncoded bit error probability P is 10^{-3}, calculate the coded bit error probability when using this best-of-five code. [10+6]

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