Code No: 09A51701 | R09 | SET-1

**B. Tech III Year I Semester Examinations, December-2011**
**ANALOG AND DIGITAL COMMUNICATIONS**
**(ELECTRONICS AND TELEMATICS ENGINEERING)**

**Time: 3 hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**

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1. a) Explain the need for modulation.
   b) A lowpass signal x(t) having a bandwidth of 10 KHz is multiplied by $\cos w_c t$ to produce $x_c(t)$. Find the value of $f_c$ so that the bandwidth of $x_c(t)$ is 1% of $f_c$. [7+8]

2. a) State briefly the important criteria in the choice of intermediate frequency of a radio receiver.
   b) A superhetrodyne receiver has an RF amplifier and an IF of 450 KHz is tuned to 600 KHz. Calculate the Q of the RF and mixer input tuned circuit both being the same, if the receiver's image rejection is to be 120. [7+8]

3. a) What is meant by the following terms in connection with frequency modulation
   i) modulation index ii) frequency deviation, and
   iii) practical bandwidth
   b) Explain the direct method of generation of FM and compare with indirect generation. [7+8]

4. a) Explain the operation of a PCM decoder. What is quantization noise? Derive the expression for SNR in PCM.
   b) Explain the difference between slope overload noise and granular noise is delta modulator. [7+8]

5. a) With the help of block diagram explain baseband binary data transmission system.
   b) What is the importance of baseband pulse shaping? [7+8]

6. a) Write the power spectral density of BPSK and QPSK signals and draw the power spectrum of each.
   b) Compare the bandwidth of QPSK system with that of BPSK system. [7+8]

7. a) What is the mutual information? State the properties of mutual information.
   b) Apply Shannon's encoding procedure to the following message ensemble:
   $[X] = [x_1, x_2, x_3, x_4]$
   $P[X] = [0.4, 0.2, 0.1, 0.3]$ [7+8]

8. a) Write the principle of convolutional codes.
   b) Generate the CRC code for the data word of 110010101. The divisor is 10101. [7+8]

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Code No: 09A51701 | R09 | SET-2

**B. Tech III Year I Semester Examinations, December-2011**
**ANALOG AND DIGITAL COMMUNICATIONS**
**(ELECTRONICS AND TELEMATICS ENGINEERING)**

**Time: 3 hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**

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1. a) Compare noise in AM and DSBSC systems .
   b) Derive an expression for $(S/N)_d$ for an AM System. [7+8]

2. a) Explain the generation of SSB using phase discrimination method.
   b) In a broadcast superhetrodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit (at the input to the mixer) is 100. If the IF is 455 KHz. Calculate the image frequency and its rejection ratio at 1000 KHz. [7+8]

3. a) Why is an FM system preferred over an AM System? Explain.
   b) In a frequency modulating system, the frequency deviation constant is k = 1 KHz|V. A sinusoidal modulating signal of amplitude 15V and frequency 3KHz is applied. Calculate
   i) The peak frequency deviation, and (b) the modulating index. [7+8]

4. a) What do you understand by PCM? How quantizing and coding is done?
   b) Explain the operation of a delta modulation system. Explain a method of overcoming limitations of delta modulation. [7+8]

5. a) Explain the duobinary baseband PAM system.
   b) What is the importance of Eye pattern? Explain. [7+8]

6. a) Explain the difference between different digital carrier modulation schemes.
   b) Draw the block diagram of QPSK system and explain its working. [7+8]

7. a) Define joint and conditional entropies. Give an example.
   b) Prove that H(X, Y) = H(X) + H(Y/X) = H(Y) +H(X/Y). [7+8]

8. a) Explain the principle and operation of encoder for Hamming code.
   b) The generator matrix for a (6, 3) block code is given below. Find all the code vectors of this code. [7+8]

$$G = \left[\begin{array}{ccc:ccc} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{array}\right]$$

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Code No: 09A51701 | R09 | SET-3

**B. Tech III Year I Semester Examinations, December-2011**
**ANALOG AND DIGITAL COMMUNICATIONS**
**(ELECTRONICS AND TELEMATICS ENGINEERING)**

**Time: 3 hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**

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1. a) Compare coherent and non-coherent detection methods of an AM signal.
   b) The modulating signal x(t)= 2 cos $2000\pi t$ + sin $4000\pi t$ is applied to a DSB modulator operating with a carrier frequency of 1MHz. Sketch the power spectral density of the modulator output. [7+8]

2. a) Define the terms sensitivity, selectivity and image frequency as applied to the study of radio receivers.
   b) What exactly, does a noise limiter do in AM receiver how does it do this? [7+8]

3. a) Derive an expression for an FM signal with carrier frequency $f_c$ and a modulating signal $A_1 \cos\omega_1 t + A_2 \cos\omega_2 t$. Obtain an expression for the spectrum.
   b) An angle modulated signal $x_c(t) = 10\cos\left[10^8\pi t + 3\sin(2\pi)(10^3 t)\right]$ is present across a 50 ohm resistive load. Find the total average power and peak frequency deviation. [7+8]

4. a) Explain the importance of prediction in DPCM.
   b) A signal x(t) = 2 cos 400 $\pi t$ + 6 cos 640 $\pi t$ is ideally sampled at $f_s$ = 500Hz. If the sampled signal is passed through an ideal lowpass filter with a cutoff frequency 400Hz, what frequency components will appear in the output? [7+8]

5. a) What is Nyquist criterion of zero ISI? Explain
   b) Explain the following
      i) Intersymbol interference ii) Eye pattern. [7+8]

6. a) Compare the bandwidth of QPSK system with that of BPSK system.
   b) Explain the principle of binary phase shift keying. [7+8]

7. a) State the properties of entropy function.
   b) Prove that H(Y/X) ≤ H(Y) with equality if and only if X and Y are independent. [7+8]

8. a) Explain role of minimum distance in error correction and detection.
   b) What are the types of errors?
   c) For a Hamming distance of 5, how many errors can be detected? How many errors can be corrected? [5+5+5]

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Code No: 09A51701 | R09 | SET-4

**B. Tech III Year I Semester Examinations, December-2011**
**ANALOG AND DIGITAL COMMUNICATIONS**
**(ELECTRONICS AND TELEMATICS ENGINEERING)**

**Time: 3 hours** **Max. Marks: 75**

**Answer any five questions**
**All questions carry equal marks**

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1. a) Derive the relationship between modulation index and total power of an AM signal.
   b) You are given the voltage signals x(t) and $\cos 2\pi f_c t$, and you wish to produce the AM waveform x(t) $\cos 2\pi f_c t$. Discuss two practical methods of generating this AM waveform. [7+8]

2. a) What is a simple automatic gain control? What are its functions?
   b) Derive an expression for $(S/N)_d$ for an SSB system. [7+8]

3. a) Compare narrow band FM with wide band FM.
   b) An angle modulated waveform is described by $x(t) = 10\cos\left[2\times10^7\pi t + 20\cos 1000\pi t\right]$. Find the approximate bandwidth of this waveform. [7+8]

4. a) Describe the spectral representation of PWM and PPM waves.
   b) Draw the block diagram of PCM scheme showing the elements required for the transmission and explain. [7+8]

5. a) What is inter symbol interference? How is it minimized?
   b) Explain the various techniques to detect the base band digital signals. [7+8]

6. a) Derive the expression for the spectrum of BPSK and sketch the same.
   b) Explain M-ary FSK systems with the help of transmitters and receivers. [7+8]

7. a) State the significance of H(Y/X) and H(X/Y).
   b) Apply Huffmann's encoding procedure to the following message ensemble and determine the average length of the encoded message.
   $\{X\} = \{x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}\}$
   $P\{X\} = \{0.18, 0.17, 0.16, 0.15, 0.10, 0.08, 0.05, 0.05, 0.04, 0.02\}$
   The encoding alphabet is $\{D\} = \{0,1,2,3\}$. [7+8]

8. a) Draw and explain the encoder circuit for convolutional codes.
   b) Given a (7, 4) linear block code whose generator matrix is given by

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

   i) Find all the code words ii) Find the parity check matrix. [7+8]

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