Code No: RR322205 **Set No.1**

III B.Tech. II Semester Regular Examinations, April/May -2005
COMMUNICATION SYSTEMS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Two random variables X & Y have a joint density function
   f (x,y) = $\frac{5}{16}x^2y$, $0 < y < x < 2$
   = 0, elsewhere
   i. Find the marginal density functions of X & Y.
   ii. Are X & Y statistically independent.
   (b) Prove that the pdf of sum of two gaussian random variables is also gaussian.

2. (a) Prove that for a suitable constant C,
   $F_x(x) = 0$, $x \leq 0$
   $= C(1 - e^{-x})^2$
   for x >0 is the distribution function for a random variable X & find C. Find $P(1 < \times < 2)$.
   (b) Draw the functional block diagram of telemetry & Telecontrol systems.

3. (a) Explain the need for modulation.
   (b) Explain the phase shift method of generation of SSB wave.
   (c) Draw the phasor diagram of AM wave if message signal is AmcosWmt & carrier signalis A_c cos W_c t.

4. (a) With neat block diagram explain the Armstrong method of generation of FM.
   (b) Draw the block diagram of Foster Seeley discriminator & explain its operation.

5. (a) Explain different types of sampling.
   (b) Explain with neat block diagram the delta modulation & demodulation.

6. (a) A signal x(t) = 2 cos 400πt + 6 cos 640πt is ideally sampled at f_c = 500Hz. The sampled signal is passed through an ideal LPF with cutoff frequency f_c = 400Hz.
   i. Sketch the frequency spectrum of the sampled wave.
   ii. State what frequency components will appear in the output of filter.
   (b) Explain U-Law & A-Law in detail.

7. (a) Derive the equation for probability of error for coherent ASK.
   (b) Explain the following signaling schemes.
   i. NRZ

ii. Manchester
iii. Duo-binary

8. Write short notes no:-

(a) TDM
(b) VSB
(c) QPSK.

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR322205 **Set No.2**

III B.Tech. II Semester Regular Examinations, April/May -2005
COMMUNICATION SYSTEMS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) X is a continuous random variable with pdf

$$\begin{aligned} fx\ (x) &= Kx, && 0 \le x \le 2 \\ &= 2K, && 2 \le x \le 4 \\ &= 6K\ \ Kx, && 4 \le x \le 6 \end{aligned}$$

find K and CDF of X.

(b) Explain the properties of gaussion distribution

2. (a) Determine the constant ?b? such that the function
f(x,y) = 3xy , $0 < x < 1, 0 < y < b$
= 0 , elsewhere
is a valid joint density function

(b) Give the properties of cumulative distribution function.

(c) Two fair dies are lossed simultaneously. Let X & Y denote the numbers on the first & second die respectively. Find

i. P (X = Y)
ii. P (X + Y = 8).

3. (a) A Gaussian random voltage has mean of 10 & variance of 25.

i. What is the probability that an observed value of voltage is greater than zero?
ii. What is the probability that observed value of voltage is greater than zero but less than or equal to the mean value.

(b) Explain in detail about telecontrol methods.

4. (a) Derive the expression for FM interms of Bessel functions.

(b) Explain the working of balanced slope detector in detail.

5. (a) Explain with neat block diagram the Coastas loop.

(b) Explain the need for modulation.

6. (a) Determine the sampling rate & inerval given the signal V(t) = 2 cos 500 πt cos1000πt .

(b) Derive the relation between quantization Noise & SNR in PCN

7. (a) Explain the advantages & disadvantages of MSK compared to Q PSK.

(b) Explain the properties of optimum binary receiver.

8. Write short notes on:-

(a) FDM

(b) Duobinary signaling.

(c) QAM

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR322205 **Set No.3**

III B.Tech. II Semester Regular Examinations, April/May -2005
COMMUNICATION SYSTEMS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) The pdf of a random variable X is given by $f_x(x) = K, a < x < b = 0$, otherwise
   i. Determine the value of the constant K.
   ii. Let a = -1, b=2. Find $P(1 \times 1 \leq C)$ for C =1/2.
   (b) Two random variables X & Y are added to form a random variable Z.
   $If \quad f_x(x) = xe^{-x}, 0 \leq x \leq \infty$
   $f_y(y) = ye^{-y}, 0 \leq y \leq \infty$
   $Find\, f_z(z)$.

2. (a) A Rayleigh density function is given by
   $f_x(x) = xe^{-x^2/2}, x \geq 0$
   $= 0$, x<0
   Find its cumulative distribution function.
   (b) Explain in detail about different methods of telemetry.

3. (a) Derive the condition for demodulation of AM, using envelope detector.
   (b) Explain Filter method of generation & demodulation of VSB.

4. (a) Explain with circuit diagram the operation of ratio detector.
   (b) Explain the differences between NBFM, AM Q WBFM.

5. (a) A bandpass signal has the spectral range that extends from 20KHz to 82 KHz. Find the acceptable range of sampling frequency f_s.
   (b) Draw the block diagram of DPCM transmitter & receiver & explain its operation with necessary waveforms.

6. (a) Compare Delta & Adaptive Delta modulation schemes.
   (b) A delta modulator system is designed to operate five times the nyquist rate for a signal with 3KHz bandwidth. Determine the maximum amplitude of a 2KHz input sinusoid for which the delta modulator does not have slope over load. Quanlizing step size is 250 mu. Derive the formula used.

7. (a) Draw the signal space diagram for coherent QPSK system & explain its characteristics in detail.

(b) A binary PSK signal is applied to a correlator supplied with a phase reference that differs from the exact carrier phase by Q radians. Determine the effect of phase errors Q on the average probability of error of the system.

8. Explain in detail about the following signallings schemes.

(a) Duo binary

(b) Manchester

(c) NRZ Unipolar & bipolar.

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR322205 **Set No.4**

III B.Tech. II Semester Regular Examinations, April/May -2005
COMMUNICATION SYSTEMS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Define probability density function. Explain the relation between probability & probability density.
   (b) Consider the pdf $f_x(x) = ae^{-b|x|}$, where X is a random variable whose allowable values range from X = - ∞ . to + ∞. Find
      i. The CD$F_x(x)$.
      ii. Relationship between a & b.
      iii. $P(1 \leq X \leq 2)$

2. (a) If the probability that a communication system will have high fidelity is 0.81 & probability that a it will have high fidelity & selectivity is 0.18, what is the probability that a system with high fidelity will also have high selectivity.
   (b) Find the values of constants a & b such that Fx is a valid distribution function where
   $$F_{x(x)} = \left[1 - ae^{-x/b}\right] u(x).$$

3. (a) Give the functional blocks of telemetry & telecontrol & explain.
   (b) Compare different methods of generation of SSB.

4. (a) Explain Armstrong method of generation of FM.
   (b) Explain in detail about FDM.

5. (a) For the analog signal x(t) = 3 cos 600 πt +2 cos 1800πt , what will be the Nyquist rate for this signal. Find also the Nyquist internal.
   (b) Explain the companding technique & different compression laws.

6. (a) What is duo binary signaling? Explain
   (b) Consider an audio - signal with spectral components limited to the frequency band of 300 to 3300 Hz. A PCM signal is generated with a sampling rate of 8000 samples. The required output signal to quantizing noise ratio is 30dB.
      i. What is the minimum number of uniform quantizing levels needed & what is the minimum number of bits per sample needed?
      ii. Calculate the minimum system bandwidth reqired.

7. (a) Explain in detail the PSK Transmitter & receiver.
   (b) Compare different shift keying techniques.

8. Write short notes on:-
   (a) Central limit theorem
   (b) Q PSK
   (c) Telemetry standards.

⋆ ⋆ ⋆ ⋆ ⋆