

**III B.Tech. II Semester Supplementary Examinations,  
November/December -2005****COMMUNICATION SYSTEMS  
(Instrumentation & Control Engineering)****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions  
All Questions carry equal marks**

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1. (a) Determine whether the following is a valid distribution function:  
$$F_X(x) = \begin{cases} 1 - e^{-x/2}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$
  
(b) Give the axioms of probability.
2. (a) What are continuous & discrete random variable. Give examples of each.  
(b) State & prove any four properties of the pdf.
3. (a) Explain about different telemetry standards.  
(b) Write about pneumatic & Electrical Telemetry. [8+8]
4. (a) Explain the need & operation of VSB modulation scheme.  
(b) Draw the block diagram of ring modulator & explain its operation. [8+8]
5. (a) An amplitude modulated signal is given by  $V_{Am}(t) = 10 \cos(2\pi \times 10^6 t) + 5 \cos(2\pi \times 10^6)t + 2 \cos 2\pi \times 10^6 t \cdot \cos 4\pi \times 10^3 t$ . Find the various frequency components and the corresponding modulation indices.  
(b) Draw the circuit diagram of center tuned discriminator & explain its operation. [8+8]
6. (a) Explain in detail different types of sampling.  
(b) A signal  $f(t)$  of bandwidth  $W=4\text{KHz}$  is transmitted using a binary companded PCM with  $\mu=100$ . Compare the case of  $L=64$  with  $L=256$  from the point of view of transmission bandwidth. [8+8]
7. (a) Describe PCM system with block diagram.  
(b) Compare the performance of PCM, DPCM, DH & ADM. [8+8]
8. (a) Derive an expression for probability error for a PSK.  
(b) Explain the operation of QPSK transmitter & receiver. [8+8]

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1. (a) If the pdf of a random variable is given by
 
$$f_X(x) = \begin{cases} K(1-x^2), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases} \quad \text{Find}$$
  - i. K
  - ii. The Distribution function of the random variable
- (b) Mention the important properties of pdf function.
2. (a) Prove that the following function is a valid density function.
 
$$F_X(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-m)^2/2\sigma^2}.$$
- (b) State the axioms of property.
3. (a) Explain different Telecontrol methods.
- (b) Explain Hydraulic & Optical Telemetry.
4. (a) Draw the spectrum of AM if carrier is  $A_c \cos w_c t$  & modulating signal  $A_m \sin W_m t$ .
- (b) Explain the effect of phase & frequency error on the synchronous demodulation of SSB wave.
5. (a) Explain with circuit diagram the operation of Ratio detector.
- (b) Compare NBFM & AM.
6. (a) Explain & A-Law &  $\mu$ -Law companders.
- (b) Draw the block diagram of DPCM system & explain its operation.
7. (a) Derive the equation for probability of error in Non-Coherent FSK demodulation.
- (b) Compare the performance of all Digital Modulation schemes.
8. Write short notes on:
  - (a) Duo-binary signalling scheme
  - (b) TDM
  - (c) FDM.

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1. (a) State & prove any Four properties of probability density function.  
 (b) Prove that the following function is a valid density function  

$$f_X(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-m)^2/2\sigma^2}. \quad [8+8]$$
2. (a) Explain What do you mean by WSS process & Ergodic process.  
 (b) State the axioms of probability. [10+6]
3. (a) Draw the block diagram of Telemetry & Telecontrol system & explain the function of each block.  
 (b) Give the state of art Telemetry standards. [10+6]
4. (a) Explain the need for modulation & frequency Translation.  
 (b) Derive the expression for AM wave whose carrier is  $A_c \cos W_c t$  & modulating signal  $A_m \sin W_m t$ . [6+10]
5. (a) Draw the block diagram of Armstrong method of generation FM.  
 (b) Write short notes on: [8+8]
  - i. FDM
  - ii. VSB.
6. (a) Explain with waveform different types of sampling.  
 (b) Draw the block diagram of Delta Modulation & explain. [8+8]
7. (a) Explain different types of M-ary signalling schemes.  
 (b) Draw the block diagram of DPSK modulator & explain its operation. [8+8]
8. Write short notes on:
  - (a) SSB Modulation
  - (b) TDM. [8+8]

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1. (a) The joint pdf of X & Y is given by  
 $f_{XY}(x,y) = xy e^{-(x^2+y^2)/2} u(x) u(y)$ .  
 i. Find marginal pdf's  $f_X(x)$  &  $f_Y(y)$   
 ii. Are X & Y independent.  
 (b) Give the axioms of probability. [5+5+6]
2. (a) The pdf of X is given by  
 $f_X(x) = K e^{-ax} u(x)$   
 Where 'a' is a positive constant. Determine the value of constant 'K'  
 (b) State & prove any Four properties of Cumulative Distribution Function. [4+12]
3. (a) Derive the relation  
 $P_t = P_c [1 + \frac{Ma^2}{2}]$  for AM Wave.  
 (b) Draw the circuit diagram of Envelope detector & explain its operation. [6+10]
4. (a) Draw the block diagram of Telemetry system & explain its operation.  
 (b) Explain different Telecontrol Methods. [10+6]
5. (a) Explain the need for Modulation.  
 (b) Compare & Contrast AM & FM. [8+8]
6. (a) Draw the block diagram of NBPM Modulator & explain its operation.  
 (b) What is Companding? Explain how companding improves the SNR of PCM system. [8+8]
7. (a) Derive bit error probability for Coherent ASK demodulation.  
 (b) Explain about different types of signalling schemes. [10+6]
8. Write short notes on:
  - (a) FDM
  - (b) QPSK. [8+8]

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