P1391

[4858] - 152

T.E. (Electronics)

DATA COMMUNICATION

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6 from section-I and Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12 from section-II.*

2) *Answers to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) State properties of CDF. **[4]**

b) Show that if a wide sense stationary process x(t) is passed through LTI filter with impulse response h(t) then its output has constant mean square value. **[8]**

c) Define autocorrelation. State and explain any three properties. **[4]**

OR

Q2) a) What are the conditions for a random process to be wide sense stationary? Explain Ergodicity. **[4]**

b) Compare binomial, poisons, Gaussian and reighlay probability models with respect to their PDF. **[8]**

c) Show that impulse response of matched filter is time reversed and delayed version of input signal. **[4]**

Q3) a) Draw line code formats for 11001001 **[8]**

        i)   RZ unipolar   ii)   NRZ polar

        iii) AMI   iv)   RZ polar

        Also sketch power spectral density

     b) Explain closed loop synchronization. **[8]**

<div align="center">OR</div>

Q4) a) Explain ISI and also how eye pattern is used to interpret ISI. **[8]**

     b) Sketch PSD for polar NRZ and bipolar NRZ. Comment on its BW and synchronisation capabilities. **[8]**

Q5) a) Explain with respect to convolutional codes: **[8]**

        i)   Code rate and Constraint length

        ii)   Steady state transitions

        iii) Trellis diagram

     b) For LBC prove that : **[10]**

        i)   Syndrome depends only on error pattern.

        ii)   All error patterns that differ by code word have same syndrome.

<div align="center">OR</div>

Q6) a) Determine the encoded message for following 8 bit data using CRC, $P(x) = x^4 + x^3 + x^0$. **[10]**

        i)   11001100   ii)   01011111

     b) A rate 1/3 convolutional encoder has generating vectors g1 = (100) g2 = (101). **[8]**

        i)   Sketch encoder configuration.

        ii)   Draw code tree, state diagram and trellis diagram.

        iii) If input message is 10110 determine output sequence.

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SECTION - II

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Q7) a) Consider a telegraph source having 2 symbols dot and dash. The dot duration is 0.2 sec and dash is 3 times of dot. The probability of dot's occurring is twice that of dash and time between symbols is 0.2 sec. Calculate information rate of source **[8]**

b) Explain mutual information. Prove that - [8]

i) I(X, Y) = I(Y, X)

ii) I(X, Y) = H(X) + X(Y) – H(X, Y)

OR

Q8) a) State and prove shannon's theorem on channel capacity. [8]

b) A voice grade telephone channel has bandwidth 3400 HZ. If SNR on channel is 30dB determine capacity of channel. If above channel is to be used to transmit 4.8kbps of data determine minimum SNR required on channel. [8]

Q9) a) Explain transmission and reception of DPSK with proper diagram and waveforms. [8]

b) Derive expression of error probability of BPSK. Compare it with error probability of BFSK. [10]

OR

Q10) a) Explain QPSK system with its mathematical expressions, spectral diagrams and signal space representations. [10]

b) Draw and explain signal space representation for orthogonal and non-orthogonal BFSK signal. [8]

Q11) a) For a 4 stage shift register with feedback combination of (4, 1) demonstrate the balance property and run property of PN sequence. Also calculate and plot the autocorrelation of PN sequence. [8]

b) Explain FHSS transmitter and receiver with neat block diagram. [8]

OR

Q12) a) State different applications of spread spectrum systems. [8]

b) Write short notes on : [8]

i) ALOHA   ii) CSMA

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