HERITAGE INSTITUTE OF TECHNOLOGY

…M Tech 1st Semester Examination. 2014……   Session   2014-15 : ……………………

Discipline   : ECE ………………………….

Paper Code : ECEN5101……Paper Name : Advanced Digital Communications
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Time Allotted : 3 hrs   Full Marks : 70

Figures out of the right margin indicate full marks.
Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1.   Choose the correct alternative for the following: 10 x 1=10

(i)   Gaussian Noise power is equal to

   (a) σ (b) σ^2 (c) $1/\sigma^2$ (d) $1/\sigma$

   (σ is the standard deviation of Gaussian pdf)

(ii)   To avoid slope overload in delta modulation, the maximum value of signal amplitude will be

   (a). sf_s (b). w/s   (c). sf_s/w (d). f_s/w

   (s = Step size; f_s = sampling frequency;   w = Signal frequency;)

(iii)   Ratio of bandwidth efficiency of QPSK signal to BPSK signal is

   (a)   ½   (b) 4   (c) 2   (d)   1/4

(iv)   OFDM signal generation requires a

   (a) multiple carrier frequencies   (b) single carrier frequency

   (c)   fewer message bits   (d)   large number of message bits

(v)   For conversion of coloured noise to white noise one of the following filters is used

   (a)   Low pass   (b)   High pass

   (c)   Band stop   (d)   Band pass

(vi)   Multiple number of signals having same carrier frequency can access a communication resource simultaneously using access technique

   (a)   TDMA   (b)   FDMA

   (c)   SDMA   (d)   CDMA

(vii)   In QPSK the transmission bandwidth required is

   (a). f_b (b). 2 f_b (c). $f_b/2$ (d). 4 f_b (f_b = Bit frequency)

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(viii)   The spectral density of a real valued random process has
   (a) an even symmetry   (b) an odd symmetry
   (c) a conjugate symmetry   (d) no symmetry

(ix)   In eye pattern, as eye closes,
   (a) ISI increases   (b) ISI decreases
   (c)   timing jitter increases   (d) timing jitter decreases

(x)   Before sampling a signal mixed with noise, a matched filter is used to
       (a) maximize signal to noise ratio
       (b) to reduce signal bandwidth
       (c) to modulate a carrier frequency
       (d) to encode a signal

Group – B

2.(a)   Distinguish between a normal and log normal distribution of a continuous random variable mentioning their properties

(b)   Write down the expressions for and explain Rayleigh and Rician distribution of random variables. Outline the application area of these distribution functions in Digital Communication Systems.   4+8 = 12

3.(a)   What is Inter Symbol Interference? How does it affect the quality of signal received in the destination?

(b)   Establish the condition required to be satisfied for attaining zero ISI when a bit stream passes through an Ideal filter

(c)   A message bit stream having a bit rate 1000 bps passes through a Nyquist filter having a roll off factor of 0.75. What should be the transmission bandwidth for achieving ISI free transmission?   4+4+4 =12

Group - C

4.(a)   Draw the signal space diagrams for BFSK and BPSK modulation signals. Define the orthogonal basis functions for these modulation schemes.

(b)   Compare the bandwidth efficiency and error performance of BFSK and MSK modulation signals.

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(c)   "In GSM cellular communication – the modulation scheme is GMSK" – why?   5+5+2=12

5.(a)   What are the advantages of M-ary modulation techniques?

(b)   How the problems faced in QPSK are solved in MSK?

(c)   With a suitable block diagram explain the principle of QPSK modulator & demodulator.   3+3+6 = 12

Group - D

6.(a)   Define Processing Gain and Jamming Margin and establish a relationship between them.

(b)   What is the purpose of spreading a signal in CDMA signal generation?

(c)   Explain the access mechanism followed in slotted ALOHA and reservation ALOHA.   5+3+4 = 12

7.(a)   Describe the principle of Direct Sequence Spread Spectrum (DSSS) communication system

(b)   Draw the block diagram of DSSS Transmitter and Detector and explain their operation.   4 +8 = 12

Group - E

8.(a)   Define decision region. What is the influence of decision region on minimum error probability in digital communication transmission?

(b)   Draw the 16 QAM signal constellation diagram showing decision region and find the expression for probability of correct decision of the entire 16 QAM signals in presence of AWGN.   (2+3) + 7 = 12

9.(a)   What is the usefulness of error control coding? What do you understand by Block coding of message bits? Comment on the bandwidth of block coded word.

(b)   Explain the following terms in connection with block coding.
        i)   Generator matrix ii) Parity Check matrix iii) Syndrome.   6+6 = 12

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