Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Tech (ECE-VLSI)/SEM-1/MVLSI-105D/2011-12

2011
ADVANCED DIGITAL COMMUNICATION

Time Allotted : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

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

Question No. 1 is compulsory and
answer any *four* from the rest.

1. a) Mention the advantages of digital communication over

        analog communication.

    b) What do you mean by PSD and ESD of a signal ?

    c) What are Ergodic processes ?

    d) Differentiate Random variable and Random process.

    e) What is the utility of coding in digital communication ?

    f) Represent 110010 using Manchester and differential

        Manchester encoding.

    g) Why is simple NRZ coding not used in Digital

   Communication ?   2 + 3 + 2 + 2 + 2 + 2 + 1

2. a) Explain the concept of signal space.

   b) What are basis vectors ?

   c) What is the utility of Gram Schmidt Orthogonalizaton procedure ?

   d) Find a set of orthonormal basis signals for a 5-dimensional signal space.

   e) Represent the following signals $s_1(t)$ and $s_2(t)$ by 5-tuple.
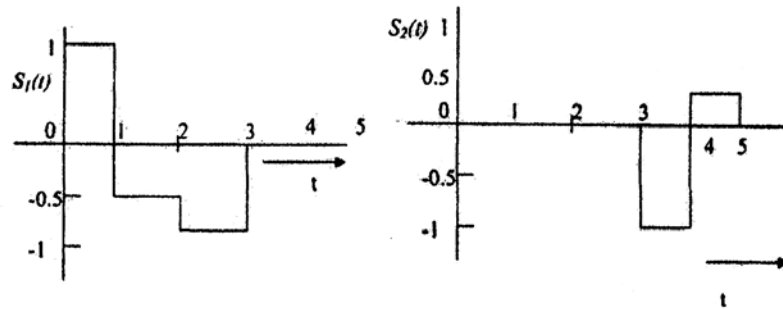
   4 + 1 + 2 + 3 + 4

3. a) Show that the probability density function of the sum of N no. of independent and identically distributed random variables will tend to Gaussian irrespective of their individual distribution.

   b) Find the power of the periodic signal defined as $S_1(t) = 1, \ 0 < t < 1; \ S_2(t) = 0, \ 0 < t < 2$ up to 2nd harmonic.   2 + 7 + 5
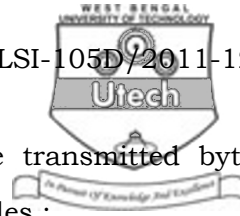
4. a) Draw the signalling pattern for the transmitted byte 01001110 using the following line codes :

   i) Unipolar NRZ

   ii) Polar RZ

   iii) Bipolar RZ

   iv) AMI

   v) Manchester coding.

   b) What is slope overloading ?

   c) Find moment generating function of Gaussian Random variable. $\qquad$ 6 + 2 + 6

5. a) Discuss one method for faster computation of LPC coefficient.

   b) If the independent random variables X and Y have the variance 36 and 16 respectively, find the correlation coefficient between $X + Y$ and $X - Y$. $\qquad$ 8 + 6

6. a) Make a comparison of BPSK, QPSK, DPSK.

   b) Find duo-binary encoded sequence for the data [0 0 1 0 1 1 0].

   c) Find probability of error in Phase Shift Keying (PSK) with imperfect bit synchronization. $\qquad$ 4 + 4 + 6

7. a) Find the transform of the output of the matched filter for the input of $S_1 (t) = A$, $0 < t < T$; $S_2 (t) = 0$ otherwise. Find the maximum SNR.

   b) Derive probability of error of matched filter. $\qquad$ 6 + 8

8. a) What are the key factors of different multiple access schemes in mobile communication ?

    b) What is chip ? Name three types of PN chip sequences. Briefly explain the function of any one of them.

    c) What is the special feature of a CDMA receiver in terms of power requirement ?

    d) Differentiate between DSSS and FHSS.

    $$3 + 4 + 2 + 1 + 4$$

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