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Code No.: 5215 M

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
M.E. I Year (ECE) II-Semester (Make Up) Examinations, August-2016
(Communication Engineering & Signal Processing)

Coding Theory and Techniques

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 X 2=20 Marks)

- Determine whether the polynomials
 $P_1(x) = x^4 + x^3 + x + 1$
 $P_2(x) = x^2 + x + 1$
over GF(2) are (i) irreducible and (ii) primitive.
- State Shannon's coding theorem.
- Write structural properties of convolutional codes.
- Explain briefly error detection and error correction capabilities of linear block codes.
- What is coding efficiency and code rate?
- Differentiate between hard decision and soft decision decoding.
- Bring out the importance of interleaving in turbo codes.
- What is the function of concatenation in turbo codes?
- Define diversity gain and coding gain.
- Discuss any two advantages of MIMO.

Part - B (5 × 10 = 50 Marks)

- For different modulation schemes, compare BER performance in AWGN channel. [10]
- a) Construct GF(8) and form addition and multiplication tables. [4]
b) Find the generator polynomials and the minimum distance for RS(15,11) code. [6]
- A 1/3 rate convolutional code has the following generators: [10]
 $g_1 = [100]$, $g_2 = [101]$, and $g_3 = [111]$.
i) Draw the trellis diagram for this code.
ii) This code is used for transmission over a AWGN channel with hard-decision decoding. The output of the demodulator detector is (101001011110111.....). Using the Viterbi algorithm, find the transmitted sequence.
- Discuss briefly turbo decoding techniques (BCJR, Iterative MAP decoding) with neat block diagrams. [10]
- a) Discuss briefly the performance of Alamouti's scheme. [5]
b) Explain orthogonal transmit diversity. What are its advantages? How is it different from space time diversity? [5]
- a) Derive an expression for the capacity of fading channel with CSI. [5]
b) Discuss the iterative decoding algorithm for binary LDPC codes. [5]
- Write short notes on any two of the following:
a) Convolutional interleaving [5]
b) Concatenation of codes [5]
c) Diversity techniques [5]
