Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 2714106 **Date: 07-01-2015**

Subject Name: Digital Modulation and Coding

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Discuss MPSK modulation in detail and derive the energy and Euclidean distance for the modulated signal. Also explain the signal space diagram for M= 2, 4, 8.	**07**
	(b)	Describe standard array decoding for the linear block codes with a suitable (6,3) code example.	**07**
Q.2	**(a)**	Describe C.P.M with full and partial response. Also discuss about phase tree and signal space diagram of binary C.P.F.S.K.	**07**
	(b)	For a (6,3) systematic linear block code, three parity check digits are V3= u0+u1+u2 V4= u0+u1 V5= u0+u2, Where u0, u1 and u2 are message digits. Then construct the appropriate generator matrix and code table. With corresponding decoding table, decode the data word if received word is: 101100.	**07**
		OR	
	(b)	Explain burst error correcting code in detail.	**07**
Q.3	**(a)**	Construct a systematic (7,4) cyclic code using a generator polynomial $g(x) = x^3+x^2+1$. Decode the data word if received codeword is r= 1101101.	**07**
	(b)	Write a short note on BCH codes.	**07**
		OR	
Q.3	**(a)**	Describe Reed Solomon codes.	**07**
	(b)	Discuss interleaved codes in detail.	**07**
Q.4	**(a)**	Compare convolution codes with linear block codes and explain encoding of rate R= ½ non systematic feed forward convolution encoder.	**07**
	(b)	Draw convolution encoder (2,1,3) for generator matrix G (D) = $[1+D+D^2+D^3 \quad 1+D+D^3]$ and hence obtain state table, code tree and trellis diagram for the same.	**07**
		OR	
Q.4	**(a)**	Explain encoding of rate R= ½ systematic feed forward convolution encoder.	**07**
	(b)	Draw convolution encoder (2,1,2) for generator matrix G (D) = $[1+D \quad 1+D+D^2]$ and hence obtain state table, code tree and trellis diagram for the same.	**07**
Q.5	**(a)**	(i) Mention the advantages of LDPC codes over turbo codes and describe basic formation of LDPC codes based on Gallagerôs idea. (ii) Show that MSK is a binary C.P.F.S.K with modulation index h= ½ and minimum frequency separation of 1/2T.	**04** **03**
	(b)	Discuss fundamental ideas behind turbo codes and hence explain basic turbo encoding structure.	**07**

OR

Q.5	**(a)**	(i) Compare TDM with FDM.	**04**
		(ii) What are PCBC & PCCC? Draw (2,1,3) convolution encoder with generator matrix G (D) = [1 $1+D+D^3$]	**03**
	(b)	Discuss basics of iterative decoding of turbo codes and hence explain it with 2-state (2,1,1) encoder with generator matrix G (D)=[1 $1/(1+D)$] using log-MAP algorithm.	**07**

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