Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II(New course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 2722709 **Date: 10/12/2015**

Subject Name: Advanced Digital Communication

Time:2:30 pm to 5:00 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)	Describe various mathematical models for communication channels.	07
	(b)	Explain Optimal Detection for a General Vector Channel in detail.	07
Q.2	(a)	Explain Carrier Recovery and Symbol Synchronization In Signal Demodulation.	07
	(b)	Derive the average bit energy for bandpass PAM signal.	07
		OR	
	(b)	Write short note on signaling schemes with memory.	07
Q.3	(a)	Derive Error Probability for PSK signaling.	07
	(b)	How a PLL can be utilized for obtaining the ML estimate of the phase of an Unmodulated carrier.	07
		OR	
Q.3	(a)	Derive the minimum error probability for optimal detection in presence of uncertainty.	07
	(b)	A convolutional code is described by g1 = [101], g2 = [111], g3 = [111] 1. Draw the encoder corresponding to this code. 2. Draw the state-transition diagram for this code. 3. Draw the trellis diagram for this code upto two frames. 4. Verify whether or not this code is catastrophic?	07
Q.4	(a)	Write and explain The Dimensionality Theorem.	07
	(b)	The block diagram of a binary convolutional code is shown in Figure 1. 1. Find the transfer function of the code T (Z). 2. What is d_{free}, the minimum free distance of the code?	07

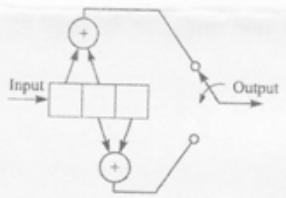

Figure - 1

		OR	
Q.4	(a)	Draw and explain Decision-directed joint tracking loop for carrier phase and symbol timing in QAM and PSK.	07
	(b)	Write short note on low density parity check codes.	07
Q.5	(a)	State and prove Nyquist condition for zero ISI.	07
	(b)	What is equalization? Explain MLSE equalization.	07
		OR	
Q.5	(a)	Describe turbo equalization.	07

(b) Figure 2 depicts a rate 1/2, constraint length K = 2, convolutional code. Sketch the tree diagram, the trellis diagram, and the state diagram. **07**

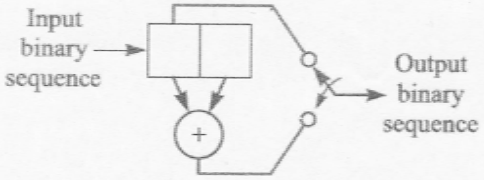

Figure - 2