

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech., Summer 2017-18 Examination

Semester: 2
Subject Code: 03204153
Subject Name: Advanced Digital Communication

Date: 23-05-2018
Time: 02:00PM to 04:30 PM
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) With necessary equations, describe in brief: **(05)**
 (i) Power Density Spectrum of Stochastic Process
 (ii) Cyclostationary Process

B) Enlist the properties of Hilbert Transform. **(05)**

C) Explain the following terms with respect to two signals **(05)**
 (i) Orthogonality, (ii) Ortho-normality (iii) Anti-podality.

Q.2 Answer the following questions. (Attempt any three) (Each five mark) **(15)**

A) Determine a set of orthonormal functions for the four signals shown in **Figure.1**

B) Given a random process $x(t)=k$, where k is an RV uniformly distributed in the range $(-1,1)$

- (i) Sketch the ensemble of this process.
- (ii) Determine expected value of $x(t)$
- (iii) Determine $R_x(t_1,t_2)$
- (iv) Is the process wide-sense stationary? Is the process Ergodic?

C) Explain Phase Modulated Signal with necessary equation. Draw and Explain Signal Space of PSK for following, considering $M=2, M=4, M=8$.

D) Draw signal space diagram of 2 component CPFSK with $h=1/4, 1/3, 1/2$ and $2/3$.

Q.3 A) With suitable example, explain Gram-Schmidt Procedure to construct orthogonal set **(07)**

B) $M = 4$ bi-orthogonal signals are constructed from the two orthogonal signals shown in **Figure.2** **(08)** for transmitting information over an AWGN channel. The noise is assumed to have zero mean and power spectral density $\frac{1}{2}N_0$. Let us determine the basis functions for this signal set, the impulse responses of the matched filter demodulators, and the output waveforms of the matched filter demodulators when the transmitted signal is $s_1(t)$.

OR

B) Explain Correlation Demodulator with necessary equations and Block diagram. **(08)**

Q.4 A) State the Nyquist pulse shaping criterion of Nyquist condition for zero ISI, and prove it. **(07)**

OR

A) Describe symbol by symbol detection method for detecting the information symbols at the receiver when the received signal contains controlled ISI. **(07)**

B) Discuss in brief: Characterization of Fading Multipath Channels. **(08)**

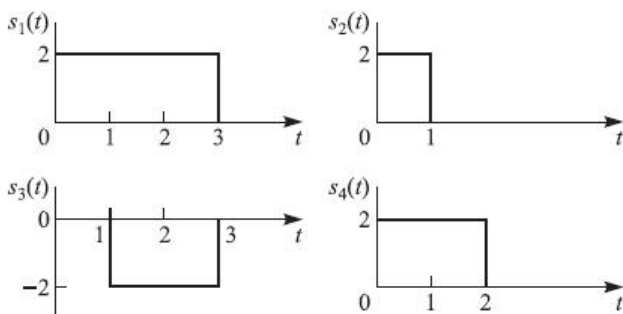


Figure.1

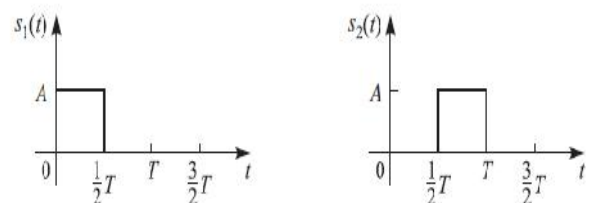


Figure.2