



Name :
Roll No. :
Invigilator's Signature :

CS/M.TECH (ECE)/SEM-1/MCE-102/2011-12

2011

ADVANCED DIGITAL COMMUNICATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

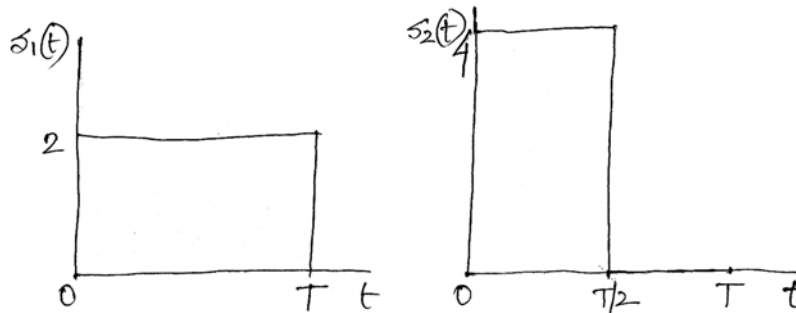
Candidates are required to give their answers in their own words as far as practicable.

Answer Question No. 1 and any four from the rest

1. Answer any *seven* questions. 7 × 2 = 14
- a) What are orthonormal signals ?
 - b) What is Gaussian probability density ?
 - c) What is the relationship between power spectral density and Autocorrelation ?
 - d) What is Flat-top sampling ?
 - e) What is quantization of signals ?
 - f) What is slope overload distortion ?
 - g) What is Adaptive Differential Pulse Code Modulation (ADPCM) and how it is estimated ?
 - h) Why split phase Manchester format is spectrally efficient as compared to UPNRZ signals ?



- i) Why PSK is used as modulation method for DSSS systems ?
 - j) What is Inter Symbol Interference ?
 - k) What is alternative characterization of partial response signals ?
 - l) What is maximum likelihood (ML) sequence detection criteria for equalization ?
2. Show how the Gram Schmitt procedure can be used to create a finite set of orthonormal functions ? Two functions $S_1(t)$ and $S_2(t)$ are shown in the following figure and the interval is from $t = 0$ to $t = T$:



Using the Gram Schmitt procedure express these functions in terms of orthonormal components. Explain how a 3-Dimensional Cartesian co-ordinate system can be used to create a signal space co-ordinate system. 6 + 4 + 4



3. State and derive the sampling theorem. What is quantization error ? Show that the mean square quantization error is expressed as $S^2/12$, where S is the step size. Show how the slope overload distortion and granular noise can be taken care of in Adaptive Delta Modulation. 4 + 2 + 4 + 4

4. What is Adaptive Quantization with forward and backward estimation ? Explain the process of Linear Predictive coding with necessary diagrams. What is Adaptive sub-band coding ? Explain how noise masking can be used to reduce the number of bits/sample. 3 + 4 + 3 + 4

5. Show that MSK is basically a FSK system with reduced bandwidth and continuous phase. Explain the generation of MSK with necessary diagrams. 10 + 4

6. Obtain an expression for noise when it is passed through an integrator. Given a white noise of magnitude of $\eta = 0.001\mu\text{W}/\text{Hz}$ is fed to following :
 - a) A RC LPF of $R = 1\text{K}$ and $C = 0.1\mu\text{F}$.
 - b) An ideal LPF of $\text{BW} = 1000\text{Hz}$.
 - c) A differentiator followed by an ideal LPF defined in (b). For differentiator, consider proportionality constant $\tau = 0.01$ unit. Find O/P noise power in each case. 7 + 7

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7. Obtain an expression for the ISI in order to design of signals in Band-limited channels. Describe the generation of partial-response signals with necessary diagrams. 7 + 7
8. Obtain an expression for the SNR of a infinite length zero-forcing equalizer for detection of data with controlled ISI. 14