

[Total No. of Questions - 8] [Total No. of Filled Pages - 2]
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1-0 DEC 2018

M. Tech 1st Semester Examination

Design of Advanced Digital Communication Systems

EC-104

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any five questions.

1. (a) Consider a PSK signal constellations with $M=2, 4$ and 8 , having same transmitted signal energy ϵ_s . Determine minimum distance d_{\min} between adjacent signal points. Calculate the amount of energy in dB by which ϵ_s must be increased for $M=8$, to achieve the d_{\min} equal to $M = 4$. (10)
- (b) Define maximum likelihood function for optimum symbol estimation in digital communication system. Explain maximum likelihood method for optimum symbol estimation. (10)
2. (a) Derive an equation for power spectrum density function for BPSK modulated signal. Draw the PSD and hence calculate bandwidth requirement of BPSK. (10)
- (b) What do you mean by matched filter receiver? Derive the transfer function for matched filter receiver. (10)
3. (a) A communication channel of bandwidth 75 kHz is required to transmit binary data at a rate of 0.1 Mb/s using raised cosine pulses. Determine the Roll-off factor. (10)
- (b) "CPFSK is nonlinear digital modulation techniques with memory"
Justify the above statement with mathematical expression in detail. (10)

2

16327

4. (a) Derive an expression for capacity of non-ideal linear filter communication channel. (10)
- (b) Describe how OFDM can achieve higher data rate compared to conventional modulation techniques. What is PAPR in OFDM and how it affects its performance? (10)
5. (a) What is correlation receiver? Derive an expression for the output of a correlation receiver and prove that correlation receiver is an optimum receiver. (10)
- (b) Derive an expression for the channel capacity of CDMA system. (10)
6. (a) Describe the process of carrier phase detection using phase locked loop. (10)
- (b) Explain how timing synchronization is carried out in spread spectrum systems. (10)
7. (a) Describe the process of symbol timing estimation in digital communication system. Explain maximum likely-hood timing estimation process. (10)
- (b) Describe the process of signal space representation of waveforms. What is the benefit of signal space representation of signals? (10)
8. Write short note on the following:
 - (a) Performance of FHSS in AWGNC.
 - (b) Effect of noise on phase detection in PLL. (10×2=20)