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M.Tech.(ECE)(Wireless communication)(2018 Batch) (Sem.–1)

ADVANCED COMMUNICATION SYSTEMS

Subject Code : MTWC-PE2A-18

M.Code : 75800

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. a) Using the Gram schmidt orthogonalization procedure, find a set of orthonormal basis function to represent the three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ as given below :

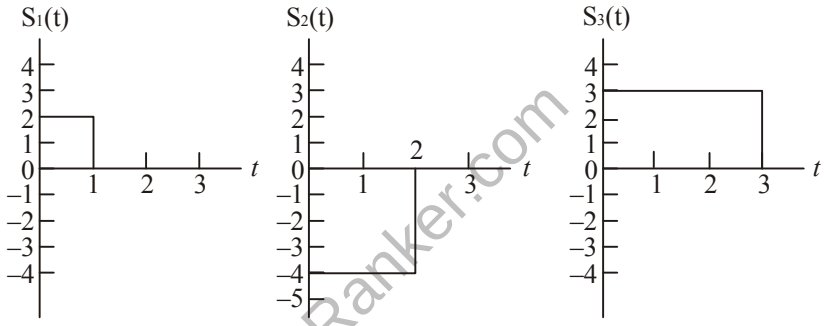

FIG.1

b) Express each of these signals in terms of the set of basis functions found in a part (a)

2. Use Schwarz's inequality to derive optimum transfer function for matched filter i.e. $h_{opt}(t)$, which maximizes output signal-to-noise-ratio ($SNR_{o,max}$) for the real-valued signal $\phi(t)$. Also, mention $H_{opt}(f)$ and $SNR_{o,max}$ clearly.

3. Consider a input binary sequence 0010110 at the input of modified duo-binary signaling scheme. Find the corresponding output binary sequence. Also extract the original sequence at the receiver using the decision rule defined for the same.

4. What is correlator? Explain the difference and similarity between correlator and matched filter.

5. What are the advantages of orthogonal frequency division multiplexing (OFDM) for digital transmission over channels subject to fading, and what is the main disadvantage of OFDM? Find an expression to find the bit error rate over AWGN channel for OFDM system.

6. Derive the condition of maximum likelihood (ML) decision rule and show that ML decision rule is to choose the message point closest to the received signal using likelihood function for AWGN channel.

7. Find an probability of Bit Error rate for the BFSK receiver in a digital communication system receives the following signal :

$$r(t) = s_i(t) + n(t),\ i = 1,2$$

Where, $s_i(t)$ is the signal component and $n(t)$ is white Gaussian noise with zero mean and $N_0/2$ variance.

8. Four signals $s_1(t)$, $s_2(t)$, $s_3(t)$ and $s_4(t)$ are of equal energy E and are defined for finite interval $0 \le t \le T$ as $s_1(t) = \sqrt{\frac{E}{T}}\varnothing_1(t), s_2(t) = \sqrt{\frac{E}{T}}\varnothing_2(t)$, $s_3(t) = -s_1(t)$ and $s_4(t) = -s_2(t)$. Also $\phi_1(t)$ and $\phi_2(t)$ are orthonormal functions defined for the interval $0 \le t \le T$. Assume the signals are transmitted with equal probability over AWGN channel. Determine :

a) The dimension of observation space

b) Signal constellation

c) Decision regions

d) Euclidean distance between signal points.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.