

B. TECH.

THEORY EXAMINATION (SEM-VI) 2016-17

DIGITAL COMMUNICATION

Time : 3 Hours

Max. Marks : 100

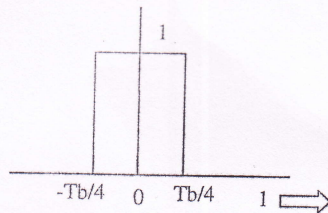
Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION - A

1. Attempt all parts of the following questions: 10 x 2 = 20
- In an experiment a trial consists of four successive with draw of playing cards from a pack of 52 cards. If we define RV X as number of king appearing in a trial. Find $F_X(x)$
 - Calculate the autocorrelation for White noise.
 - What is the condition to justify the orthogonality of two signals?
 - What is essential bandwidth for polar NRZ line codes?
 - Explain the difference between slow hopping and fast hopping.
 - Compare the spectrum occupancy of PSK and FSK schemes.
 - Explain the Bay's rule of probability.
 - Explain the advantages of Manchester coding.
 - Draw the Manchester representation for the sequence 1010101001111
 - Discuss BPSK modulator.

SECTION - B

2. Attempt any five parts of the following questions: 5 x 10 = 50
- Find the PSD $S_y(f)$ for a polar random signal use a basic pulse as shown in fig. below. The digits are 1 and 0 equally likely and digits are transmitted every T_b seconds. Each digit is in dependent of the remaining digits.



- Explain the working of frequency hopping spread spectrum system. Discuss its applications in detail. A slow FH/MFSK system has following parameters:
 - The number of bits per MFSK symbol = 4
 - The number of MFSK symbols per hop = 5
 - Calculate the processing gain of the system in decibels.
- What is the probability of error in presence of white noise for BPSK system? We are required to transmit 2.08×10^6 binary digits per second with $P_b \leq 10^{-7}$. The channel noise PSD is $S_n(f) = 10^{-8}$. Determine the transmission bandwidth and signal power required in binary.
- A binary communication channel, the receiver detects the pulse with an error probability P_e . What is the probability that out of 100 received digits, no more than four digits are in error.
- A source emits one of the four messages randomly every microsecond. The probabilities of these messages are 0.4, 0.3, 0.2 and 0.2. Messages are generated independently.

- (i) What is the source entropy?
- (ii) Obtain a compact binary code determine the average length, efficiency and redundancy of codeword.
- (f) Explain the convolution codes, their advantage and disadvantage.
- (g) Explain the Chebyshev's Inequality.
- (h) What is a PN sequence? Draw the PN sequence generator and define its autocorrelation function. A PN Sequence is generated using linear feedback shift register with number of stages equal to 10. The chip rate is 10^7 per second. Find the following:
 - (i) PN sequence length
 - (ii) chip Duration
 - (iii) period of PN sequence

SECTION - C

Attempt any two parts of the following questions:

2 x 15 = 30

- 3. Explain the principle of OFDM.
- 4.
 - (i) Write a short note on Matched Filter.
 - (ii) Find the probability of error for a matched filter? Explain how a matched filter works as correlator receiver.
- 5. Write short notes on :
 - (i) Central limit theorem
 - (ii) Error Correcting codes