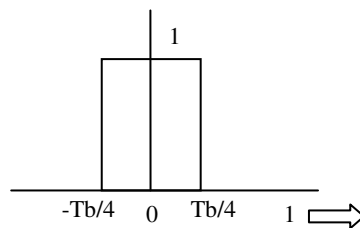


**B. TECH.****THEORY EXAMINATION (SEM–VI) 2016-17**  
**DIGITAL COMMUNICATION***Time : 3 Hours**Max. Marks : 100**Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.***SECTION – A**

1. **Attempt all parts of the following questions:** **10 x 2 = 20**
- (a) 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  $F_X(x)$
  - (b) Calculate the autocorrelation for White noise.
  - (c) What is the condition to justify the orthogonality of two signals?
  - (d) What is essential bandwidth for polar NRZ line codes?
  - (e) Explain the difference between slow hopping and fast hopping.
  - (f) Compare the spectrum occupancy of PSK and FSK schemes.
  - (g) Explain the Bay's rule of probability.
  - (h) Explain the advantages of Manchester coding.
  - (i) Draw the Manchester representation for the sequence 1010101001111
  - (j) Discuss BPSK modulator.

**SECTION – B**

2. **Attempt any five parts of the following questions:** **5 x 10 = 50**
- (a) 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 independent of the remaining digits.



- (b) Explain the working of frequency hopping spread spectrum system. Discuss its applications in detail. A slow FH/MFSK system has following parameters:
  - (i) The number of bits per MFSK symbol = 4
  - (ii) The number of MFSK symbols per hop = 5
  - (iii) Calculate the processing gain of the system in decibels.
- (c) What is the probability of error in presence of white noise for BPSK system? We are required to transmit  $2.08 \times 10^6$  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.
- (d) 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.
- (e) 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