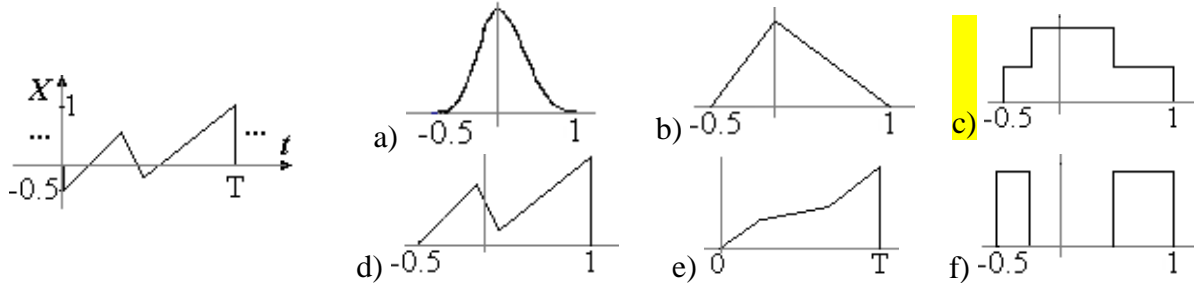
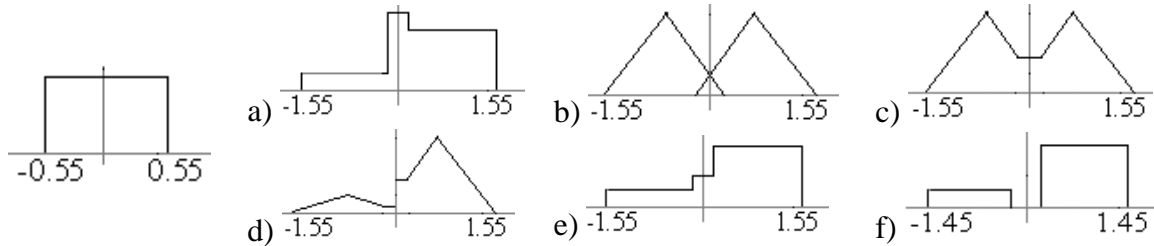


1. Which of the following can be the probability distribution function of the random variable X representing the samples taken from the periodic signal given?



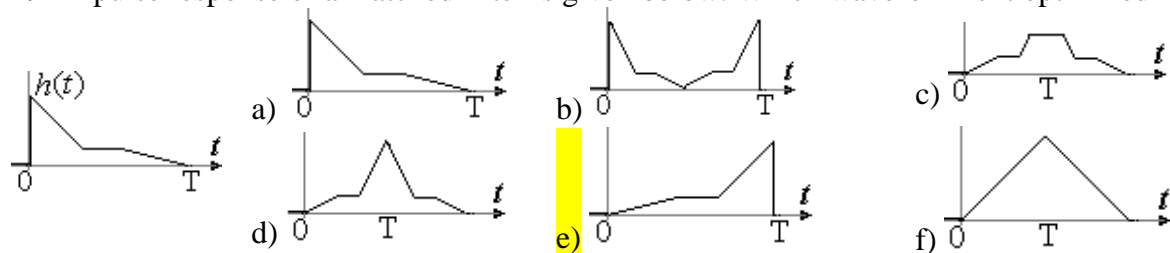
2. A binary channel with signal values -1 and 1 is under additive noise with pdf given. Since transmission probability of 1 is three times higher than that of -1, what would be the channel output pdf? (**İPTAL**)



3. A Huffman code is generated for a set A of 9 symbols with probabilities v and it is found that $L_{avg} = H(v)$. What is the probability of a symbol that is represented by 2 bits?

a) 0.75 b) 0.125 c) 0.5 **d) 0.25** e) 0.01 f) 0.135

4. Impulse response of a matched filter is given below. Which waveform is it optimized for?



5. Symbols in the set $\{a, b, c, d\}$ are ordered according to their probabilities from highest to lowest. What is the encoded binary stream for the symbol stream abacad?

a) 100101010 **b) 01001100111** c) 00011010 d) 11100110101 e) 0101011100 f) 01011110

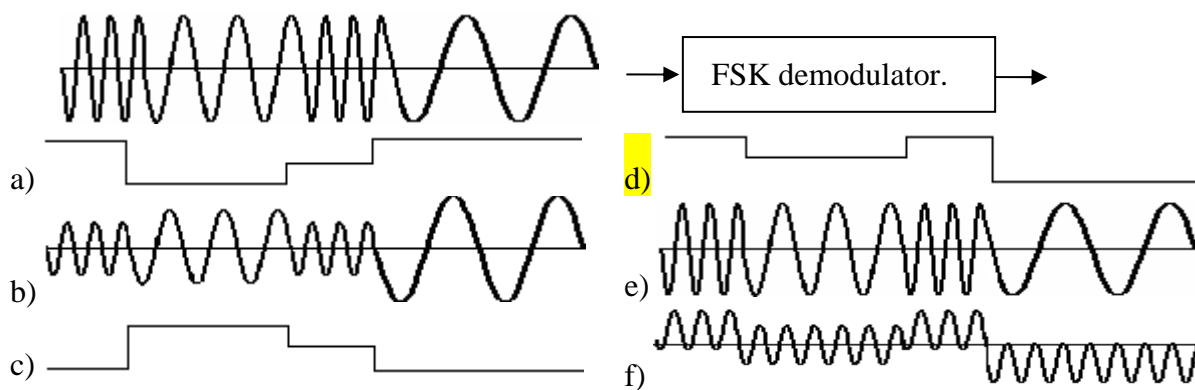
6. Input to the filter $H(f) = \begin{cases} 1, & |f| < 2 \\ 0, & \text{otherwise} \end{cases}$ is white noise $\frac{N_0}{2}$. What is the noise-equivalent bandwidth of the filter?

a) $0.25N_0^2$ b) $2N_0$ c) N_0 d) 3 e) 4 **f) 2**

Note : No books, notes allowed in exam. 60 minutes.

Mark your answers **only** in the box provided on the bottom of **next page**.

7. Two identical amplifiers with available power gains of $H_{\max}^2 = 10$ and noise figures of $F = 5$ are cascaded. What is the equivalent noise figure?
a) .5.5 **b) 5.4** c) 10 d) 4 e) 50 f) 6.26
8. For symbols {00,01,10,11} in QPSK, I and Q values are given as $I=[1 \ 0 \ -1 \ 0]$ and $Q=[0 \ 1 \ 0 \ -1]$ respectively. What is the phase difference between the signals representing the symbols 01 and 10?
a) 180 b) 45 **c) 90** d) 135 e) 0 f) 270
9. Bandwidth of a telephone line is 19266 Hz. What should be the SNR in order for this line to carry 256 kbps data?
a) 50 dB b) 80 dB c) 30 dB d) 20 dB e) 10 dB **f) 40 dB**
10. The following FSK signal has three distinct frequencies; f_c , $f_c - \varepsilon$ and $f_c + \varepsilon$. What would be the output of the FSK demodulator?



11. For a QPSK channel, probability of error is same for all transmitted symbols and is equal to 0.01. Symbol transmission probabilities are 0.1, 0.2, 0.3 and 0.4. What is the probability of erroneous reception?
a) 0.01 b) 0.02 c) 0.025 d) 0.03 e) 0.04 f) 0.0125
12. For an asymmetric binary channel input probabilities are $P(0) = 0.4$ and $P(1) = 0.6$. Error probabilities are given as 0.01 when 1 is sent and 0.02 when 0 is sent. What is the probability of receiving 0?
a) 0.502 b) 0.5 c) 0.4 d) 0.602 e) 0.398 f) 0.392

$$C = W \log \left(1 + \frac{P}{N_0 W} \right)$$

$$H = -\sum_i P_i \log P_i$$

$$F = F_1 + \sum_k \frac{F_k - 1}{\prod_i H_i^2}$$

$$I_i = -\log P_i$$

$$A(dB) = 10 \log A$$

$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1} \left(\frac{x}{a} \right) + c$$

[illegible]