

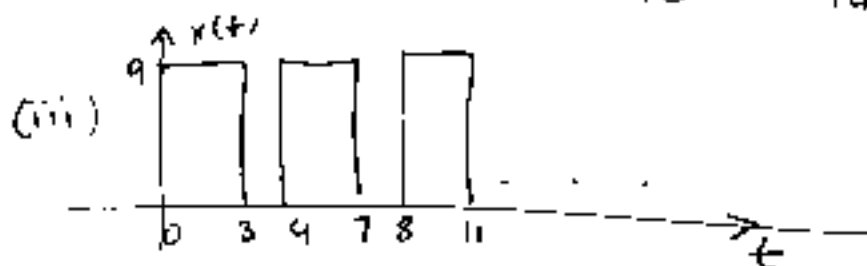
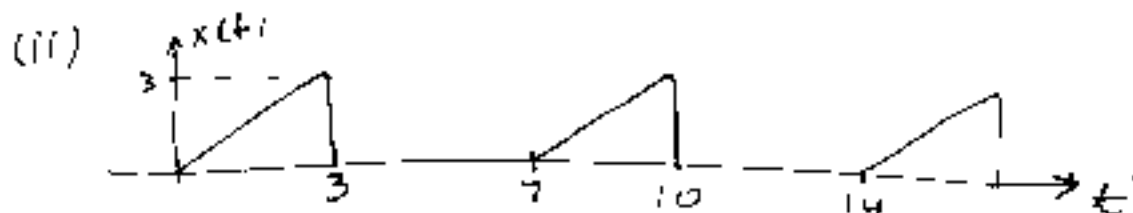
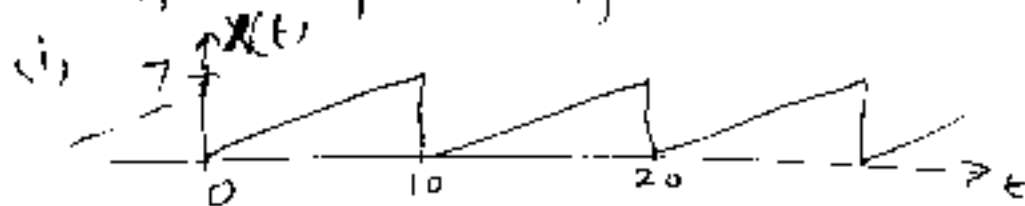
Prob 1 Find and sketch the time-autocorrelation $R_x(k)$ for the periodic sequences:

(i) + + + - - + -

(ii) + - + - - + + +

(iii) + - + - - +

Prob 2 Find and sketch the time-autocorrelation for $R_x(z)$ for the periodic functions:



Prob 3 Find the ensemble autocorrelation function, $R_x(z)$, for $X(t) = A \cos(3t + \theta)$, where θ is a uniformly distributed r.v. over $(0, 2\pi)$.

Prob 4 Find the Huffman binary and ternary codes for messages with prob:

(i) 0.4, 0.3, 0.12, 0.10, 0.03, 0.02, 0.02, 0.01

(ii) 0.2, 0.19, 0.18, 0.15, 0.12, 0.11, 0.03, 0.02

(iii) 0.4, 0.3, 0.2, 0.05, 0.02, 0.01, 0.01, 0.01

Find the average length in each case.

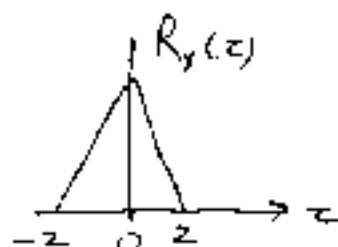
Prob 5 How many 60 dB, 6 kHz audio ~~channel~~ ^{signals} can be sent over a 30 dB, 2 MHz link?

Prob 6 Find the power spectral density for

(i) $R_x(\tau) = e^{-2\alpha|\tau|}$

(ii) $R_x(\tau) = 2 \cos 2\pi\tau$

Prob 7 Find $S_x(\omega)$ if $R_x(\tau)$ is



Prob 8 For Prob 4 (iii) find the binary Shannon-Fano code

Prob 9 Find the correlation coefficient ρ if the joint prob mass fn is as shown:

		Y				
		0	1	2	4	7
X	1	0	$\frac{1}{7}$	$\frac{1}{7}$	0	0
	2	0	0	0	$\frac{1}{7}$	0
	3	$\frac{1}{7}$	$\frac{1}{7}$	0	0	0
	5	0	0	0	0	$\frac{1}{7}$
	6	0	0	$\frac{1}{7}$	0	0

Prob 10 For the sequence

... 1 2 3 4 5 6 5 4 3 2 1 1 1 2 3 3 3 4 5 4

find the future values by using the model

$$X(n+1) = c(0)X(n) + c(1)X(n-1) + c(2)X(n-2)$$

Use the autocorrelation function approach.

Prob 11 Among n coins, one is known to be lighter than the others. What is the minimum no. of weighings needed to find the light coin?