Experiment 3

Title: Perform the experiments using MATLAB to develop program for discrete correlation.

Aim: To study the discrete correlation of basic signals.

Theory:
Page no. 118 to 120 of prescribed test book TB1 as in course file as included in Appendix 1.

MATLAB code:

```
%% Program for autocorrelation between two sequences....
%% without using the inbuilt function xcorr

clc;
clear all;
close all;
%% Inputs
% You can specify the inputs or can take them through command window
% h= input ('enter the sequence h');
% x= input ('enter the sequence x');
h=[1 1 2 3 4];
x=[1 3 5 7 9 2 4 6 8];
pp=h;qq=x;
% Plot the inputs
% subplot(3,1,1); stem(h,'m'); title ('h');ylabel('amplitude')
% %
% subplot(3,1,2); stem(x,'b'); title ('x');ylabel('amplitude')
%% calculate the cross correlation
l1= length (h); % calculate length of sequence h
l2= length (x); % calculate length of sequence x
l=abs (l1-l2); % calculate difference in lengths of sequence
if (l1 > l2)
x= [x zeros(1,l)];
else if(l2 > l)
h= [h zeros(1,l)];
   end
end
h= [h zeros(1, max (l1, l2))];
for shift= 0:max(l1,l2);
new_x = [zeros(1, shift) x zeros(1, (max (l1 , l2))-shift)];
y(shift+1,:)= sum(h.* new_x);
end
y=y';
% Display the correlation sum
subplot(3,1,1); stem(pp,'m'); title ('h');ylabel('amplitude')
subplot(3,1,2); stem(qq,'b'); title ('x');ylabel('amplitude')
subplot(3,1,3); stem(y,'r'); title ('cross correlation');
xlabel('time');
```

Result and analysis:

Result should follow the following steps:

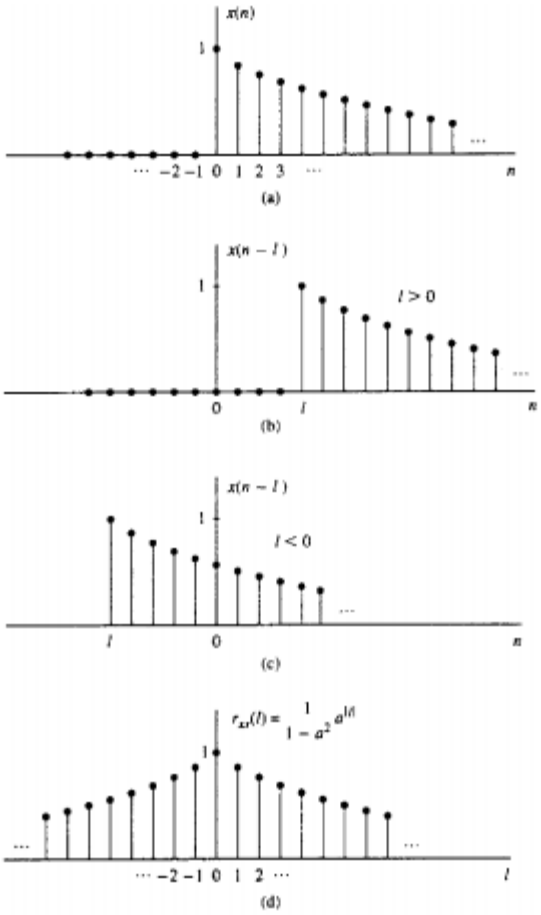
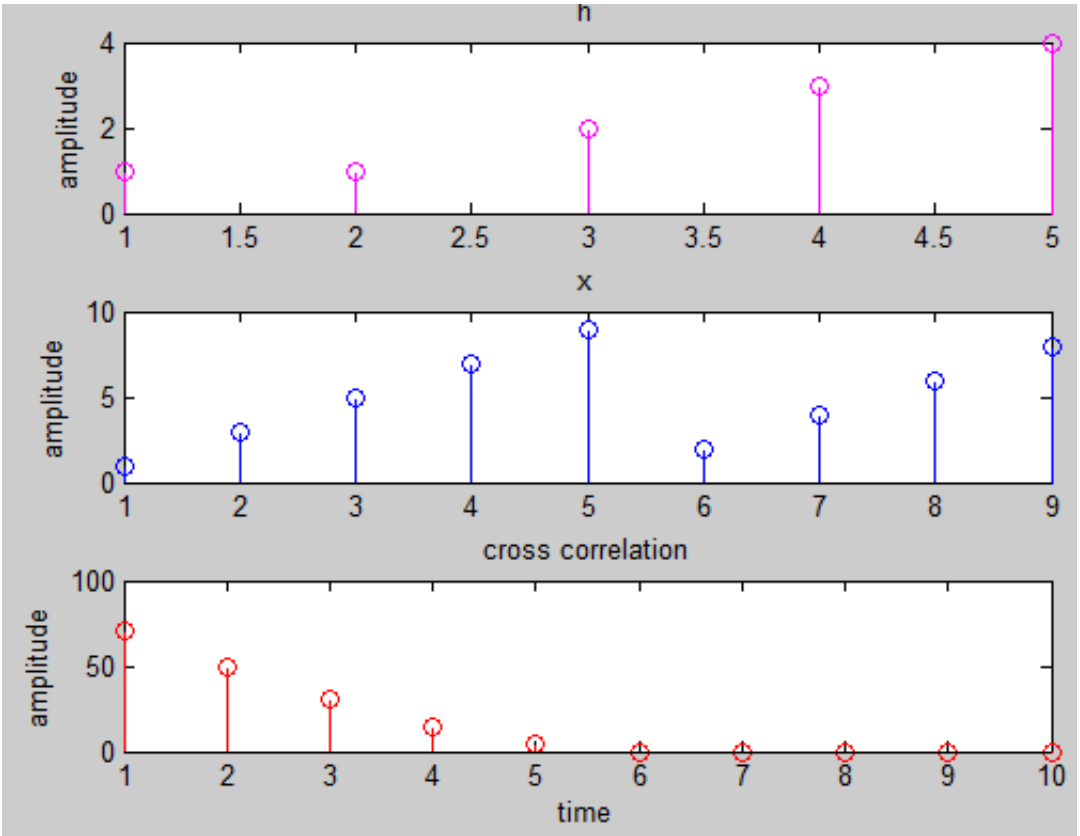


Figure 2.39 Computation of the autocorrelation of the signal $x(n) = a^n$, $0 < a < 1$.



1. Observe the signal pattern.
2. Check whether the signal is periodic or aperiodic?
3. Vary the sampling time.

Observations:

Conclusions: