-> KALPIT BORKAR	200070029
-> NAVNEET	200070048
-> SANJHI PRIYA	20 D0 700 70
-> YUVRAJ SINGH	200070093

1. Given, Rxx (T) for T = ___ -2,-1,0,1,2 - ..., and X(n+1) = ax(n) us linear estimate for X(n+1) For zero mean Wss sequence Xn), we know that E[Xn] = 0 Ynez (z as its a disorete case). $R_{X}(n_{1},n_{2}) = E[X(n_{1})X(n_{2})] = R_{X}(n_{1}-n_{2})$ (i). linear estimate for Xn+1, or minimizing.

We have to find the minimum mean square error

E [(x(n+1) - x(n+1)2]

=> IMSE (a) = E [(x(n+1) - ax(n))] = $E[(X(n+1))^{2} + a^{2}(X(n))^{2} - 2a X(n+1)X(n)]$ = E (X(n+1).X(n+1)) + a2 E [X(n) X (n)] - 2a E [X(n+1)(X(n))] By (i).

 $MSE(a) = R_{XX}(0) + a^2 R_{XX}(0) - 2a R_{XX}(1)$.

MSE'(a) = 2a Rxx(a) - 2 Rxx(1).

For minima,

 $MSE^{\dagger}(a) = 0$, we get $a = \frac{R \times x(1)}{1}$

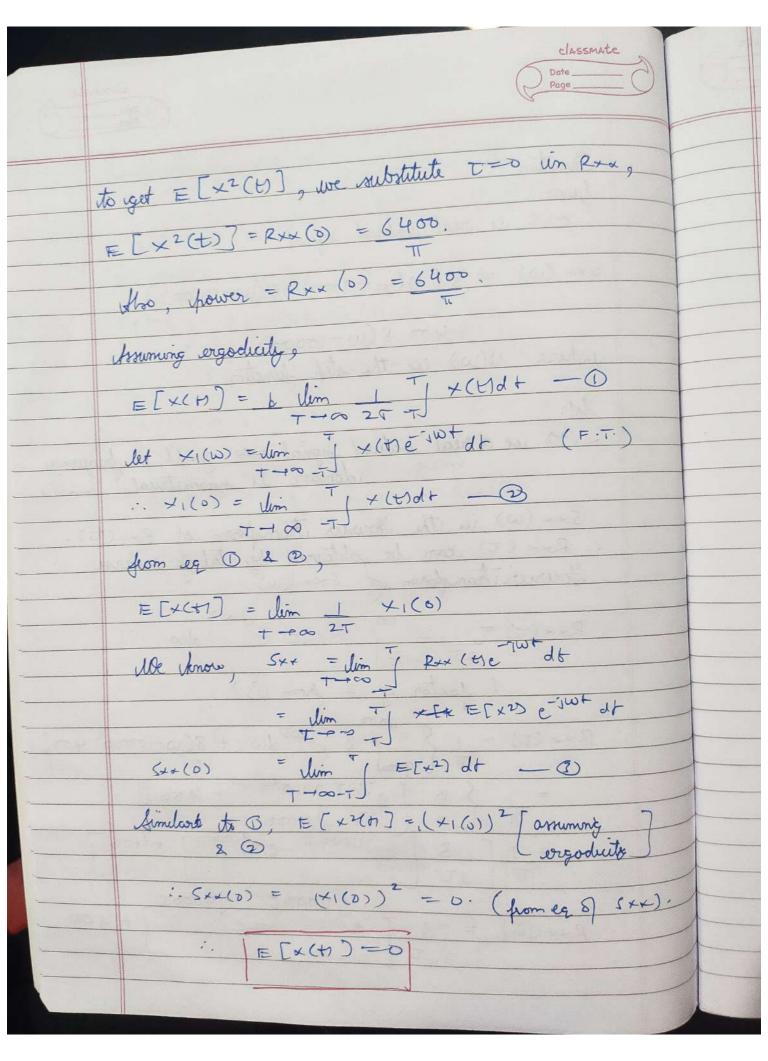
As this is a quadratic equation, maxima will be at a -100. So our, $a = \frac{R_{x}(1)}{R_{xx}(0)}$, is the minima.

 $MM3E = Rxx(0) + \frac{Rxx(1)}{Rxx(0)} - \frac{2Rxx(1)}{Rxx(0)} = Rxx(0) - \frac{Rxx^2(1)}{Rxx(0)}$

MMSE linear estimate for XA+1) is $\hat{X}(n+1) = \frac{R \times X(1)}{R \times X(0)} X(n)$



Question 2:		
lywen: X(t) in real valued signal.		
((() - 2 [1)(10 - 9000) - U(w-11000)]		
$5 \times \times (\omega) = 3 \left[U(\omega - 9000) - U(\omega - 11000) \right]$		
+400 8 (w-10000) where V(w) in the step function.		
where U(w) is the step function.		
Sol:		
Sol: x(t) in a real valued signal => graph in frequency domain is symmetrical D		
Sxx (W) in the Fourier transform of Rxx(T). Rxx (T) can be obtained by taking inverse Fourier transform of Sxx (W).		
: Rxx (t) can be obtained by taking unverse		
Fourier transform of Sxx (w).		
JWT WYCT P DID		
$ \frac{1}{10000000000000000000000000000000000$		
(jactor of 2 from B).		
:. Rxx(T) = 1 \ (3. e) wt dw + S(w-10000).400}		
= 1 5 3: [e JWT 7 11000 + 400 [
T \ () I) 9000 J		
= 1 [3 [c) 11000 T - e) 9000 D7 + 400 7		
TIST		
J11000E J9000E		
: Rxx(T) = 3 [e -e + 400.		
TITL		



a) The $E(Q_n)$ is varying as

No changes so we can't

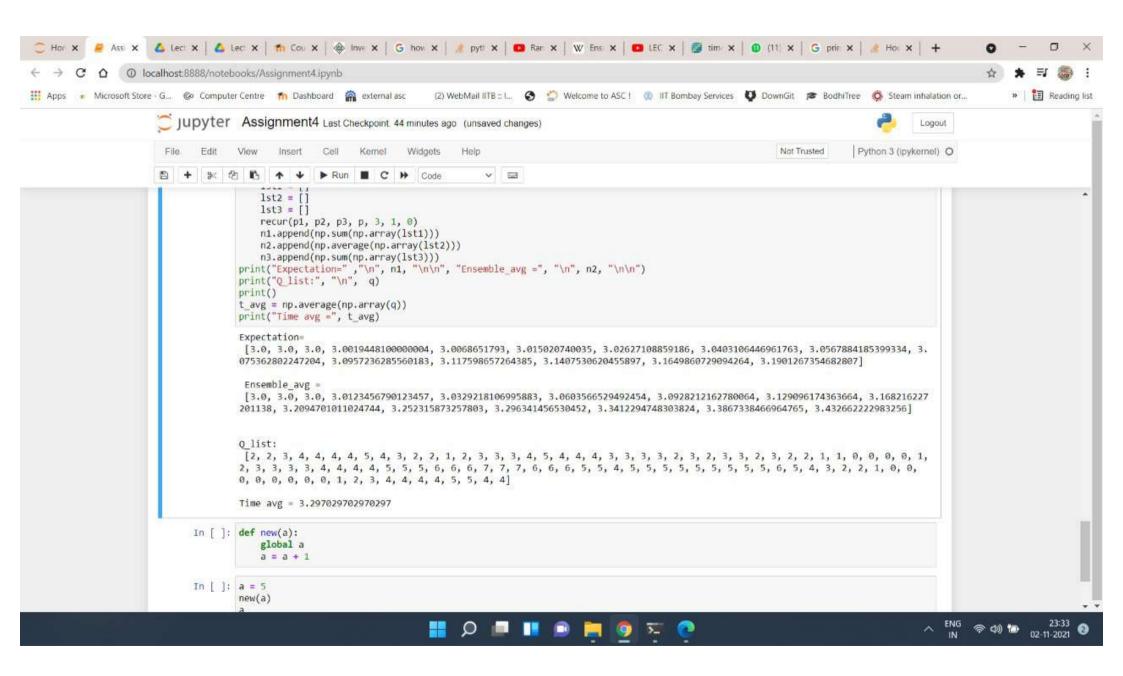
Say that for part (a)

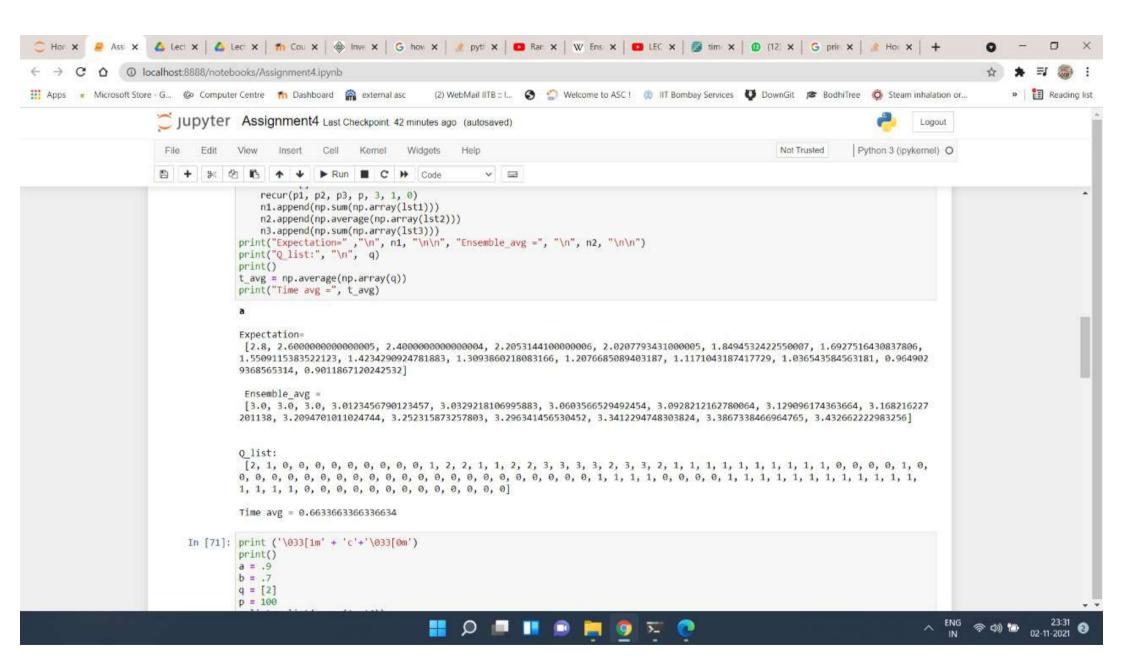
it's stationary.

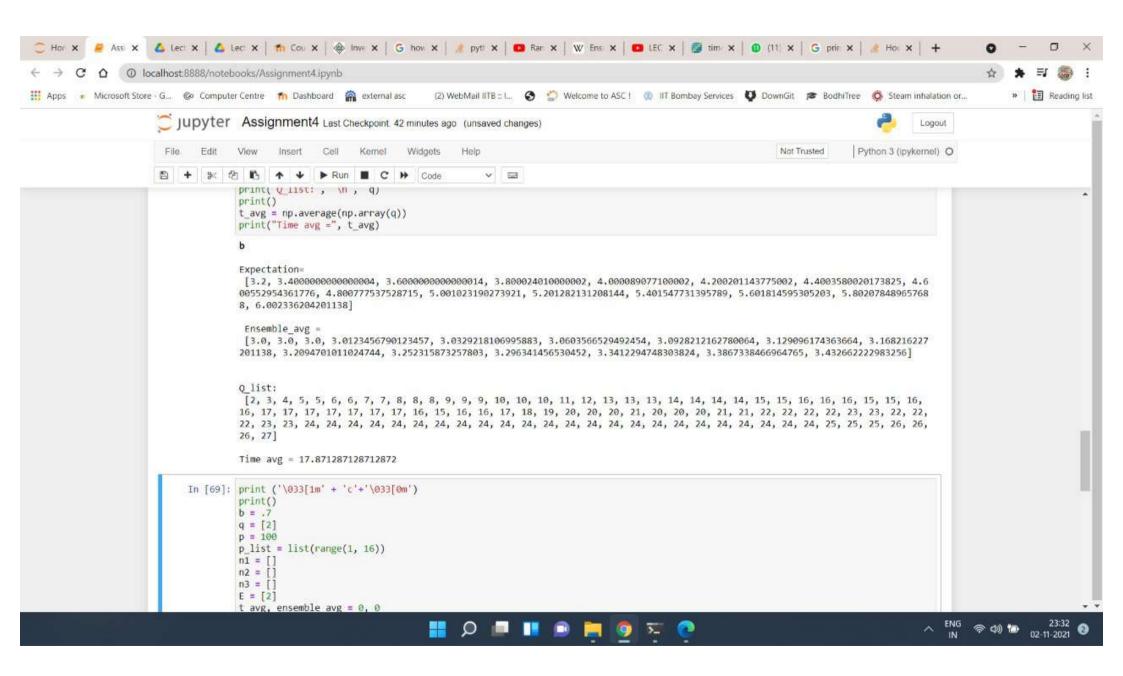
For part (6) also E (on) is Varying as n vary, so it's also not stationary

For part (c) E [len] is very not varying much, we can consider it to be stationary,

Since, for part a, t process is not WSS, we will not talk about ergodicity, For part c, ensemble average = time average So, part c is ergodic also







Question 4:	
Ko ily a grandom seguence	taking walues un
× n is a random sequence {1, 2, 3, 4, 5, 63. with	probability

 $P(x_n = j \mid x_{n-1} = i) = pij$

To check stationarity 4 ergodicity, we check the time average and ensemble average.

- Here, the time average is constant. Thus the process is statemary.

 The process is not orgadic, because in some cases

 time average # ensemble average.
- (b) Here, mean is constant correspective of time = stationary procestime and = ensemble and = not ergodic
- (c) The ensemble mean is not constant (eliferents for deferent coses).

 => Not stationary => not ergodii
- (d) Mean take a constant walue, verespective of time.

 = stationary process

 However, ensemble any + time any

 mot ergodei.