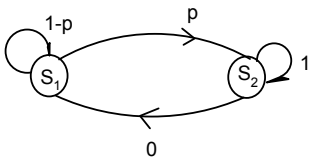
B.Sc. (Honours) Examination, 2019
Semester-VI
Computer Science
Course : BCSE-62
(Stochastic Process)

Time : 3 Hours **Full Marks : 40**

Questions are of value as indicated in the margin

Answer **any four** questions

1. a) How offline processing of data is different from its online counterpart? 2
   b) If $\{X_t \mid t \geq 1, t \text{ integer}\}$ is the dataset arriving online explain how you may determine the mean of the observations arrived upto a certain time point. 4
   c) Hence, determine the space and time complexity of the online mean computation. 2+2=4
2. a) If $\{(X_t, Y_t) \mid t \geq 1, \ t \text{ integer}\}$ is an ongoing temporal process, determine the variance of the process upto a certain time point. 6
   b) Hence, find out the space and time complexity of the variance computation. 2+2=4
3. If $\{X_t Y_t \mid +t \geq 1, t \text{ integer}\}$ is the dataset arriving online, where X_t and Y_t are independent (explanatory) and dependent (linearly on X_t) variables respectively, derive the estimated (dynamic) value of the unknown slope parameter upto a certain time point. Hence, gustify whether the processing is online or quasi-online. 9+1=10
4. a) Explain autocorrelation and autoregression with suitable examples. Discuss how lag is significant in this context? (2+2)+2=6
   b) What is white noise? What are its characteristics? 2+2=4
5. a) Define Poisson Process clearly stating the properties. 2+2=4
   b) Customers arrive at a service facility according to a Poisson process of rate λ (λ>0). Let N(t) be the number of customers arrived upto time t (t > 0) and let T_1, T_2,… be the successive arrival times of the customers.
      i)Find $E(T_4 - t \mid N(t) = 3)$
      ii) Find $E(T_4 \mid N(t) = 3)$
      iii) Find $E(T_5 \mid N(t) = 3)$ 2+2+2=6
6. a) What do you mean by a markov chain. 4
   b) Consider the following one step state transition (stationary)



   Determine the n-step transition probability from state S_1 to state S_2.
   Hence, show that state S_2 is asymptotically absorbing. 4+2=6
