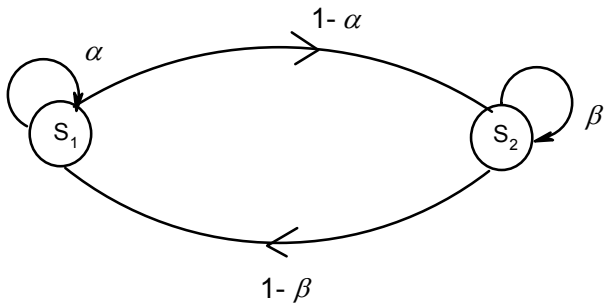
B.Sc. (Honours) Examination 2018
Semester-VI
Computer Science
Course : BCSE-62
(Stochastic Process)

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

Questions are of value as indicated in the margin

Answer **any four** questions

1. a) Define a Markov Chain. In this context explain - 4+(1×3)=7
   i)Row stochasticidty, (ii) column stochasticity, and (iii) Double stochasticity of a transition matrix.
   b) Justify or falsity – "If P is a row stochastic matrix so is $P^n \forall$ integer n, $n \geq 1$." 3
2. Consider the following state transition characteristic



   a) Represent it in terms of a transition probability matrix. 1
   b) Under what condition S_2 will be an absorbing state? Justify. 1+4=5
   c) Is it possible that both S_1 and S_2 are absorbing simultaneously? Justify. If yes, what will be the transition matrix? Otherwise, explain why not? 1+2+1=4
3. Consider the following one step non stationery transition dynamics with respect to two states S and S_2

$$P_t(S_1 \mid S_1) = \alpha(t)$$
$$P_t(S_2 \mid S_2) = \beta(t) \qquad t \geq 1$$

   Where t represents the discrete time point (epoch) and P_t indicates the transition at time t.
   a) Can S_1 be an absorbing state? If yes, under what condition? If no, why not? Justify. 5
   b) Explain memorylessness associated to a dynamic process. In this context, illustrate what do you mean by marginal probability of states S_1 and S_2. 2+3=5
4. a) What do you mean by an Autoregressive Process? State the AR(P) process mathematically. 2+2=4
   b) Estimate the parameter of an AR (1) process (Linear) providing requisite derivation. 6
5. Under what condition may a linear AR(P) process be reduced to a linear AR(P-1) process for $p \geq 2$ (p being integer)? Provide complete mathematical justification. 10

P.T.O.

6. Write short notes on (**any two**) : 5×2=10
   a)Autocorrelation
   b) Polynomial AR(1) process
   c) Asymptotic characteristic of a random process.

———