EE 693 Quiz 2 Maximum Marks: 20 Time: 40 minutes Date 2.11.2021

Q.1 Suppose $\{X_n, n \geq 0\}$ is a 3-state MC with $V = \{0,1,2\}$ and state transition matrix $\mathbf{P}$ given by

$$\mathbf{P} = \begin{bmatrix} 0 & 1 & 0 \\ 0.5 & 0 & 0.5 \\ 1 & 0 & 0 \end{bmatrix}$$

(2)+(3)+(5)

(a) Draw the state transition graph of the chain.

(b) Find the communicating class (classes) of the chain. Is $\{X_n, n \geq 0\}$ irreducible?

(c) Find the first return probabilities $f_{00}^{(n)}$ for $n = 1,2,3$ and examine if the state 0 is recurrent. Find if there is any other recurrent state in the chain.

Q.2 The number of customers arriving at a grocery store can be modelled by a Poisson process with a rate of 10 customers per hour. The store opens at 7 hour and closes at 23 hr. (3)+(3)+(4)

(a) Find the probability that there are 2 customers between 10:00 and 10:20 hr.

(b) Find the probability that there are 2 customers between 10:00 and 10:20 and 7 customers between 10:20 and 11hr.

(c) Given that there is no arrival till 7-30 hr, what is the probability of the first arrival before 8hr.?