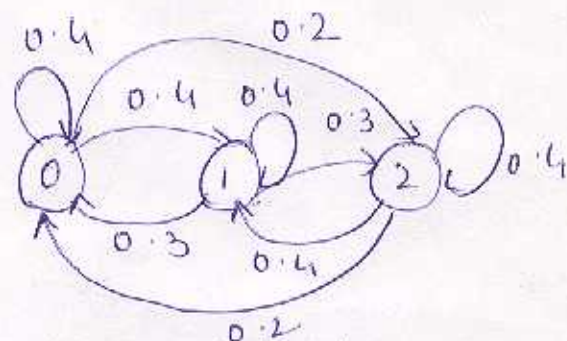


Question 5:

$$P = \begin{bmatrix} 0.4 & 0.4 & 0.2 \\ 0.3 & 0.4 & 0.3 \\ 0.2 & 0.4 & 0.4 \end{bmatrix}$$



Since all states communicate, it is irreducible.

Also all states are aperiodic.

Since the state space is finite, it is positive recurrent.

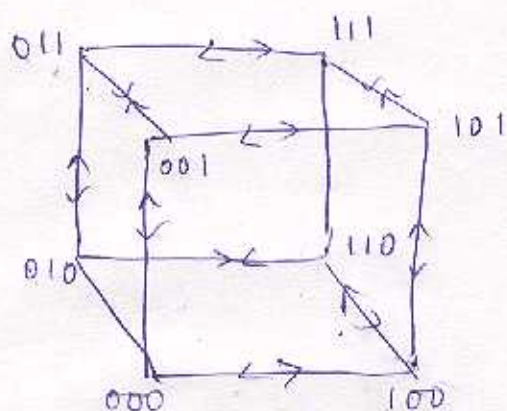
Therefore, there is a unique stationary distribution.

Solving the global balance equations will yield

$$\pi = [0.3, 0.4, 0.3]$$

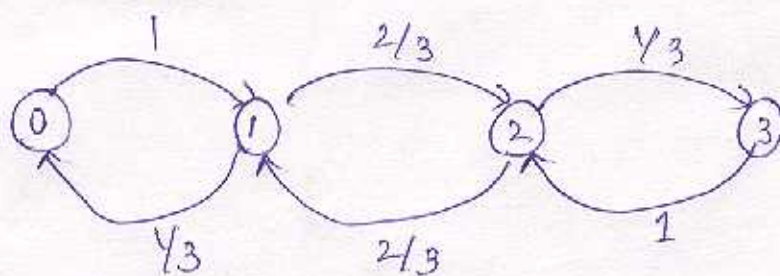
Question 4:

a)



Each edge has $\frac{1}{3}$ probability

b)



c)

Let a_i = Mean time for Y to first reach state zero starting in state i .

From the above Markov chain (part b), we have

$$a_1 = 1 + \frac{2}{3}a_2$$

$$a_2 = 1 + \frac{2}{3}a_1 + \frac{a_3}{3}$$

$$a_3 = 1 + a_2$$

Solving these,

$$a_1, a_2, a_3$$

$$= [7, 9, 10]$$

$$E[T] = 1 + a_1 = 1 + 7 = \underline{\underline{8}}$$