

MIDSEM TEST

Missing Values

X	A	B	C
5.1	6	1.8	2.2

Question 1

$$N_t \sim \text{Poisson}(5.1t)$$

$$N_t - N_s \sim \text{Poisson}(5.1(t - s))$$

- a. The inter-event time follows a Poisson Distribution
- b. $E(N_t - N_s) = 5.1(t - s)$
- c. $E(N_6) = \text{Mean}(\text{Poisson}(5.1 * 6)) = 30.599999999999998 \approx 30.6$
- d. $\Pr(N_3 > 1.8 + E(N_2)) =$
 $E(X_2) = 10.2$
 $\Pr[N_3 > 10.2 + 1.8] = 0.7564968855759098$
- e. $\Pr(N_2 > 2.2) = 0.9976500924527895$

Question 2

- a. For the chain to be an absorbing Markov process, every state must be able to reach a state that is absorbing. So a, b both have to be 1 since we could start at either state 1 or state 2, and since both states are absorbing the chain will be considered an absorbing Markov process. Another option would be to direct to only one state, i.e. $a \rightarrow b$ only or $b \rightarrow a$ only. So $(a = 0, b = 1)$ or $(a = 1, b = 0)$ respectively.
- b. For a continuous-time Markov chain to be an absorbing Markov process the generator matrix, $A = [\{(-a), a\}, \{b, (-b)\}]$, the rows should equal to 0 and However the
- c. Given enough cycles, the distribution matrix for the Markov chain will eventually become a stationary distribution

Question 3

a. $P =$

$[0, 0.5, 0.5,$
 $0.5, 0, 0.5,$
 $0.5, 0.5, 0]$

b. $\Pr(\text{period} = 2) = 1/4$

$a \rightarrow b \rightarrow a$

$a \rightarrow c \rightarrow a$

$b \rightarrow a \rightarrow b$

$b \rightarrow c \rightarrow b$

$c \rightarrow a \rightarrow c$

$c \rightarrow b \rightarrow c$

c. $D = [$

0.5

0.5

$0.5]$

Final distribution $= D * P = [0.5, 0.5, 0.5]$

The final distribution does not change regardless of where the starting state is, since every final position is equally likely.

Chelaka Paranaheva

Question 4

Missing Values

0.076404	0.195743	0.371898
X	Y	Z

$$6q58 = 58p * (1 - 6p58)$$

$$_tq_x = (1 - _tp_x) = 1 - E\left(-\int_0^5 (\mu_{55+s}) ds\right)$$

$$\mu_{60} \rightarrow 0.51434404563185$$

$$\mu_x = Bc^x$$

Equations:

$$\mu_{60} = Bc^{60} = 0.51434404563185$$

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Question 5