Assignment-12

The due date for submitting this assignment has passed.

Due on 2021-04-14, 23:59 IST.

As per our records you have not submitted this assignment.

1) Consider the state sequence $X_0, X_1, \ldots, X_n$. The Markov property states that *1 point*

- $\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_{n+1} = s_j)$
- $\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_{n+1} = s_j | X_n)$
- $\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_{n+1} = s_j | X_0)$
- $\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_n = s_j | X_{n-1}, X_{n-2}, \cdots, X_0)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_{n+1} = s_j | X_n)$

2) Consider the state sequence $X_0, X_1, \ldots, X_n$. The time homogeneous stationary property states that *1 point*

- $\Pr(X_{n+1} = s_j | X_n) = \Pr(X_1 = s_j | X_0)$
- $\Pr(X_{n+1} = s_j | X_n) = \Pr(X_n = s_j | X_{n+1})$
- $\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_{n+1} = s_j)$
- $\Pr(X_{n+1} = s_j | X_n, X_{n-1}, \cdots, X_0) = \Pr(X_{n+1} = s_j | X_0)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\Pr(X_{n+1} = s_j | X_n) = \Pr(X_1 = s_j | X_0)$

3) Which of the following matrices can represent the transition probability matrix for a Discrete Time Markov Chain (DTMC) *1 point*

- $\begin{bmatrix} 0.65 & 0.25 \\ 0.35 & 0.75 \end{bmatrix}$
- $\begin{bmatrix} 1.20 & -0.20 \\ -0.55 & 1.55 \end{bmatrix}$
- $\begin{bmatrix} 0.25 & 0.35 \\ 0.40 & 0.10 \end{bmatrix}$
- $\begin{bmatrix} 0.95 & 0.05 \\ 0.90 & 0.10 \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{bmatrix} 0.95 & 0.05 \\ 0.90 & 0.10 \end{bmatrix}$

4) Consider a two state DTMC with $\Pr(X_{n+1} = s_1 | X_n = s_1) = \Pr(X_{n+1} = s_1 | X_n = s_2) = 0.2$. The transition probability matrix $\mathbf{P}$ for this DTMC is given as *1 point*

- $\begin{bmatrix} 0.2 & 0.2 \\ 0.8 & 0.8 \end{bmatrix}$
- $\begin{bmatrix} 0.2 & 0.2 \\ 0.2 & 0.2 \end{bmatrix}$
- $\begin{bmatrix} 0.2 & 0.8 \\ 0.2 & 0.8 \end{bmatrix}$
- $\begin{bmatrix} 0.8 & 0.2 \\ 0.8 & 0.2 \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{bmatrix} 0.2 & 0.8 \\ 0.2 & 0.8 \end{bmatrix}$

5) The transition probability matrix of a DTMC has the property *1 point*

- Elements in each column sum to one
- Elements in each row are identical
- Elements in each row sum to one
- Elements in each column are identical

No, the answer is incorrect.
Score: 0

Accepted Answers:
Elements in each row sum to one

6) Consider a DTMC with the one-step transition probability matrix *1 point*

$$\mathbf{P} = \begin{bmatrix} \frac{2}{3} & \frac{1}{3} \\ \frac{1}{6} & \frac{5}{6} \end{bmatrix}$$

The two-step transition probability matrix is given as

- $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{3}{4} & \frac{1}{4} \end{bmatrix}$
- $\begin{bmatrix} \frac{1}{4} & \frac{3}{4} \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$
- $\begin{bmatrix} \frac{3}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$
- $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}$

7) Consider the one-step transition probability matrix $\mathbf{P}$ for a Discrete Time Markov Chain (DTMC) given as *1 point*

$$\mathbf{P} = \begin{bmatrix} 0.45 & 0.55 \\ 0.35 & 0.65 \end{bmatrix}$$

The two step transition probability for starting from state 2 and ending in state 1 is given as

- 0.385
- 0.245
- 0.655
- 0.735

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.385

8) Consider the one step transition probability matrix $\mathbf{P}$ for a DTMC and the stationary probability distribution $\bar{\boldsymbol{\pi}}$ such that the sum of elements of $\bar{\boldsymbol{\pi}}$ equals one. Then, $\bar{\boldsymbol{\pi}}$ is *1 point*

- Dominant right singular vector of $\mathbf{P}$
- An eigenvector of $\mathbf{P}^T$
- Belongs to the null-space of $\mathbf{P}$
- Dominant left singular vector of $\mathbf{P}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
An eigenvector of $\mathbf{P}^T$

9) Consider a DTMC with the one-step transition probability matrix *1 point*

$$\mathbf{P} = \begin{bmatrix} 0.30 & 0.7 \\ 0.8 & 0.2 \end{bmatrix}$$

The limiting distribution for this DTMC is approximately

- $0.53, 0.47$
- $0.25, 0.75$
- $0.34, 0.66$
- $0.12, 0.88$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$0.53, 0.47$

10) Consider the one step transition probability matrix $\mathbf{P}$ for a DTMC. The stationary probability distribution of the DTMC is given as *1 point*

- Each row of the matrix $\lim_{n\to\infty} n\mathbf{P}$
- Each column of the matrix $\lim_{n\to\infty} \frac{\mathbf{P}}{n}$
- Each column of the matrix $\lim_{n\to\infty} \mathbf{P}^n$
- Each row of the matrix $\lim_{n\to\infty} \mathbf{P}^n$

No, the answer is incorrect.
Score: 0

Accepted Answers:
Each row of the matrix $\lim_{n\to\infty} \mathbf{P}^n$