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Courses » Advanced Topics in Probability and Random Processes

Announcements Course Ask a Question Progress Mentor FAQ

Unit 9 - Week 8: Martingle Process

Course outline

How to access the portal

Week 1: Introduction to probability and Random Variable

Week 2: Random process basics and infinite sequence of events

Week 3: Convergence of Sequence of Random Variables

Week 4: Applications of Convergence Theory

Week 5: Markov Chain

Week 6:Discrete Time Markov Chain

Week 7: Continuous Time Markov Chain

Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-10-03, 23:59 IST.

1) The state holding time T_i at a state i of a CTMC is given by $f_{T_i}(t) = ve^{-vt}u(t), v > 0$. The conditional probability $P(T_i > 10/T_i > 5)$ is equal to *0 points*

- e^{-5v}
- e^{-10v}
- $1 - e^{-5v}$
- $1 - e^{-10v}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
e^{-10v}

2) Suppose a Poisson process $\{X(t), t \geq 0\}$ with the rate parameter $\lambda = \frac{1}{2}$ is at state i. If $P_{i,j}$ denotes the transition probability from state i to state j of the corresponding embedded Markov chain, then the value of $P_{i,i+1}, i > 0$ is equal to *1 point*

- 0
- 1/3
- 1/2
- 1

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Process-2
Quiz : Assignment 8
Quiz : Assignment 9
New Unit
Assignment Solutions

process with the arrival rate λ. If $N(0) = 0$ then the probability that there is exactly k customers in the service station at time t is

- $P(N(t) = k) = \frac{e^{-\lambda}\lambda^k}{k!}$
- $P(N(t) = k) = 1 - e^{-\lambda kt}$
- $P(N(t) = k) = \frac{e^{-\lambda t}(\lambda t)^k}{k!}$
- $P(N(t) = k) = e^{-\lambda kt}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P(N(t) = k) = \frac{e^{-\lambda t}(\lambda t)^k}{k!}$

4) Consider a birth-death process $\{X(t), t \geq 0\}$ with constant birth-rate $\lambda = \frac{1}{4}$ and a constant death rate $\mu = \frac{1}{2}$. If $P_{i,j}$ denotes the transition probability from state i to state j of the corresponding embedded Markov chain, then the value of $P_{i,i+1}, i > 0$ is equal to *1 point*

- 1/4
- 1/2
- 2/3
- 1/3

No, the answer is incorrect.
Score: 0

Accepted Answers:
1/3

5) Consider a birth death process with the arrival rate λ_i and the service time parameter μ_i . For this process,the backward Kolmogorv equation is *1 point*

- $\frac{dp_{i,j}(t)}{dt} = -(\lambda_i + \mu_i)p_{i,i}(t) + \lambda_i p_{i+1,j}(t) + \mu_i p_{i-1,j}(t)$
- $\frac{dp_{i,j}(t)}{dt} = -(\lambda_j + \mu_j)p_{i,j}(t) + \lambda_{j-1} p_{i,j-1}(t) + \mu_{j+1} p_{i,j+1}(t)$
- $\frac{dp_{i,j}(t)}{dt} = -(\lambda_i + \mu_i)p_{i,j}(t) + \lambda_{j-1} p_{i,j-1}(t) + \mu_{j+1} p_{i,j+1}(t)$
- $\frac{dp_{i,j}(t)}{dt} = -(\lambda_j + \mu_j)p_{i,j}(t) + \lambda_i p_{i+1,j}(t) + \mu_i p_{i-1,j}(t)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{dp_{i,j}(t)}{dt} = -(\lambda_i + \mu_i)p_{i,i}(t) + \lambda_i p_{i+1,j}(t) + \mu_i p_{i-1,j}(t)$

6) Consider a birth death process with the arrival rate λ_i and the service time parameter μ_i . For this process, the global balance equation at state $j \neq 0$ is *1 point*

$\pi_{j-1}\lambda_{j-1} + \pi_{j+1}\lambda_{j+1} = \mu_j\pi_j + \mu_{j+1}\pi_{j+1}$

$\pi_{j-1}\lambda_{j-1} + \pi_{j+1}\mu_{j+1} = (\lambda_j + \mu_j)\pi_j$

$\pi_{j-1}\lambda_{j-1} + \pi_{j+1}\mu_{j+1} = \mu_j\pi_j + \lambda_{j+1}\pi_{j+1}$

$\pi_{j-1}\mu_{j-1} + \pi_{j+1}\lambda_{j+1} = \lambda_j\pi_j + \mu_{j+1}\pi_{j+1}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\pi_{j-1}\lambda_{j-1} + \pi_{j+1}\mu_{j+1} = (\lambda_j + \mu_j)\pi_j$

Previous Page Next Page