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Courses » Advanced Topics in Probability and Random Processes

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Unit 5 - Week 4: Applications of Convergence Theory

Course outline

Assignment 4

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

Due on 2018-09-12, 23:59 IST.

1) Consider the sequence of events on the real line given by $A_n = \begin{cases} (1, 3+\frac{1}{n}), & \text{n odd} \\ (2-\frac{1}{n}, 5), & \text{n even} \end{cases}$. Find $\lim_{n\to\infty} \sup A_n$ and $\lim_{n\to\infty} \inf A_n$. ***1 point***

- (1,5),(2,3)
- (2,3),(1,5)
- (1,4),(2,3)
- (1,3),(3,5)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(1,5),(2,3)

2) Suppose $\{A_n\}_{n=1}^{\infty}$ is a sequence of subsets of $\mathbb{R}$, given by $A_n = [1, 5 - \frac{1}{n}]$. find $\lim_{n\to\infty} \sup A_n$ and $\lim_{n\to\infty} \inf A_n$. ***1 point***

- (1,5), (1,5)
- [1,5), [1,5)
- [1,5), [1,5]
- [1,5], [1,5]

No, the answer is incorrect.
Score: 0

Accepted Answers:
[1,5), [1,5)

3) $\{X_n\}$ is a sequence of independent random variables ***1 point***

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Score: 0

Accepted Answers:
Borelcantelli lemma 2

4) $\{X_n\}$ is a sequence of independent random variables with $P(X_n = 0) = 1 - \frac{1}{n^2}$ and $P(X_n = n) = \frac{1}{n^2}$. Which one of the BorelCantelli lemmas can be used to show if $\{X_n\}$ converges almost sure to $\{X = 0\}$ or not? ***1 point***

- BorelCantelli Lemma 1
- BorelCantelli Lemma 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
BorelCantelli Lemma 1

5) Suppose $\{X_n\}$ is a sequence of independent random variables taking two values $X_n = \sqrt{n}$ with probability $\frac{1}{n}$ and $X_n = 0$ with probability $(1 - \frac{1}{n})$. Examine if $\{X_n\}$ converges to $\{X = 0\}$ in probability, in distribution or in mean square sense. ***1 point***

- Converges in probability
- Converges in distribution
- Converges in mean square

No, the answer is incorrect.
Score: 0

Accepted Answers:
Converges in distribution

6) Consider a random process $X(t) = A\cos(\omega_0 t)$ where ω_0 is a constant and A is uniformly distributed between -5 and 5. Then ***1 point***

- $EX(t)$ is a constant
- $EX(t)X(t+\boldsymbol{t})$ is a function of lag $\boldsymbol{t}$ only
- $X(t)$ is a wide-sense stationary process
- $X(t)$ is a strict-sense stationary process

No, the answer is incorrect.
Score: 0

Accepted Answers:
$EX(t)$ is a constant

7) Consider a random process $X(t) = \cos(\omega_0 t + f)$ where ω_0 is a constant, f is uniformly distributed between -p to p and A is zero mean random variable with variance 1 and independent of f. Then ***0 points***

- $EX(t)$ is a constant
- $EX^2(t) = A^2$
- $X(t)$ is a wide-sense stationary process

$X(t)$ is a strict-sense stationary process

No, the answer is incorrect.
Score: 0

Accepted Answers:
$EX(t)$ is a constant
$X(t)$ is a wide-sense stationary process

8) $\{X(t)\}$ is a wide-sense stationary Gaussian random process. Then *1 point*

$EX(t) = 0$

$cov(X(t), X(t+\tau) = 0$

The random variables $X(t_1), X(t_2), \ldots, X(t_n)$ are jointly Gaussian

$\{X_n\}$ is strict-sense stationary

No, the answer is incorrect.
Score: 0

Accepted Answers:
The random variables $X(t_1), X(t_2), \ldots, X(t_n)$ are jointly Gaussian
$\{X_n\}$ is strict-sense stationary

9) Suppose $X(t)$ is a constant-mean independent increment process. For $t_1 > t_2$ *1 point*

$X(t_1)$ and $X(t_2)$ are independent

$X(t_2)$ and $X(t_1) - X(t_2)$ are independent

$EX(t_1)X(t_2) = EX^2(t_1)$

$EX(t_1)X(t_2) = EX^2(t_2)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$X(t_2)$ and $X(t_1) - X(t_2)$ are independent
$EX(t_1)X(t_2) = EX^2(t_2)$

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