RTSM/QUIZ/3

Fill in the blanks (Numerical)

Date of Exam : 18th Nov, 2021

Time : 12:00 Noon to 1:00 pm am

Duration : 50min

No of questions: ALL Questions

Type: Random-sequential (navigation NOT allowed)

Each question carries 4 marks

November 18, 2021

1. Every time series is a stochastic process
   ANSWER : TRUE

2. Normally distributed white noise is a dependent sequence
   ANSWER :FALSE

3. I.I.D. sequence is always white noise.
   ANSWER: FALSE

4. A binary process with values $+1$ and -1 can have maximum variance 0.5
   ANSWER: FALSE

5. A random walk with zero mean is a white noise.
   ANSWER:FALSE

6. A standard Brownian Motion is a Gaussian Process with variance $t(1-t)$ at time $0 < t < 1$.
   ANSWER: FALSE

7. If (X_t, X_s) follows bivariate normal distribution $N(0, 0, 1, 1, 0.5)$ for all integers t and s, the $\{X_n\}$ is a strongly stationary time series.
   ANSWER: TRUE

8. Partial correlation coefficient measure the linear dependency among prediction error.
   ANSWER:FALSE

9. $(I-B)^2 X_5 = \nabla_2 X_3$
   ANSWER:FALSE

10. When L_2 convergence holds then Weak Law of Large Number will also hold.
    ANSWER: TRUE

11. Conditional variance of $(X_t|X_{t-1})$ is always larger than variance of X_t ANSWER: FALSE

12. Let X_t be a $MA(q)$ process with $\theta_j = (0.7)^j$ for $j = 0, 1, 2, 3, \ldots$. Find value the auto-covariance function $\gamma_X(2)$ when $q = 500$ variance of white noise is 4.

    [Answer only within the error range ∓ 0.005 will get the credit]

    ANS : 3.843137
    $(0.7)^2 * 4/(1-0.7^2) = 3.843137$

13. Let $X_t = 0.5X_{t-1} + W_t$ where $W_t \sim WN(0, 4)$ then the $Cov(\sqrt{n}(\hat{\rho}(1) - \rho(1)), \sqrt{n}(\hat{\rho}(2) - \rho(2)))$ is

    [Answer only within the error range ∓ 0.005 will get the credit]

    ANSWER : 1.5
    $1 + 2 * 0.5^2 = 1.5$

14. Let $X_t = 0.25X_{t-1} + W_t$ where $W_t \sim WN(0, 4)$ then the long run variance is

    [Answer only within the error range ∓ 0.005 will get the credit]

    ANSWER : 7.111
    $(2/(1-0.25) - 1) * 4/(1-0.25^2) = 7.111$

15. Let $X_t - 0.5X_{t-1} = W_t + 0.27W_{t-1}$ where $W_t \sim WN(0, 9)$ then $\gamma_X(5)/\gamma_X(1)$ is

    [Answer only within the error range ∓ 0.005 will get the credit]

    ANSWER : 0.0625
    RANGE : 0.005

16. Consider values of Z_t for $t = 1, 2, ..., 10$ as $\{0.00, 0.99, -0.27, -0.92, 0.52, 0.77, -0.73, -0.57, 0.89, 0.33\}$. Find the value of $\nabla_2 \nabla Z_4$.

    [Answer only within the error range ∓ 0.005 will get the credit]

    ANSWER : -1.64

    $z[4] - z[3] - z[2] + z[1] = -1.64$

17. Consider a weakly stationary time series X_t with zero mean. Suppose that the coefficient of the best linear predictor of X_{11} based on $\mathbf{X_{10:5}} = (X_{10}, X_9, ..., X5)^T$ is $\mathbf{a_{10:5}} = (0.12, 0.32, 0.51, 0.64, 0.55, 0.11)^T$. Find the covariance between $(X_{11} - \mathbf{a_{10:5}^T X_{10:5}})$ and $(X_{10} + 0.9X_8 + 1.1X_5)$

    [Answer only within the error range ∓ 0.005 will get the credit]

    ANSWER : 0