

MIDTERM 1, PART II

STAT 485/685 E100/G100: Applied Time Series Analysis, SFU

Oct. 8, 2020

This part of the exam will be submitted via Crowdmark.

Important policies on assignment submissions:

- Each question should be uploaded separately to Crowdmark.
- Answers can be hand-written, written on a tablet, or typed.
- However, submissions must be either **PDF documents or image files (.jpg or .png)**. Unfortunately, Crowdmark does not accept Word files.
- Please **show all your work**, in order to get full marks.
- If you are hand-writing answers, please make sure they are **neat and clearly readable**, and that the photo is high resolution. There may be penalties if the marker cannot clearly read your answers.
- Please clearly label the question numbers, and **include your name and student number** on each question.
- No teamwork, communication or collaboration is allowed. This includes asking for help on the Internet.

Academic dishonesty in any form will not be tolerated. Prohibited acts include, but are not limited to, the following:

- i) the unauthorized sharing of material during an “open book” examination;
- ii) concealing information pertaining to the examination in the vicinity of where the exam will occur;
- iii) the unauthorized possession or use of course notes or any other aids (calculators, books, websites) not approved by an instructor during an examination;
- iv) the unauthorized use of devices, such as mobile phones, to receive or share information pertaining to the examination;
- v) the unauthorized possession or use of a completed examination or assignment;
- vi) using, or attempting to use, another student’s answers, or providing answers to other students;
- vii) the unauthorized access or sharing of information or resources, in any format, pertaining to the examination.
- viii) impersonating a candidate or being impersonated in an examination.

1. (6 marks) Let $\{e_t\}$ be a white noise process, with mean zero and variance σ_e^2 . Let $Y_t = e_t - 2e_{t-1}$.
 - (a) Find the mean function for $\{Y_t\}$.
 - (b) Find the autocovariance function for $\{Y_t\}$.
 - (c) Find the autocorrelation function for $\{Y_t\}$.
 - (d) Is $\{Y_t\}$ weakly stationary? Why or why not?
2. (5 marks) Let $\{X_t\}$ be a stochastic process with mean function $6t$ and autocovariance function $(0.1)^k$.
 - (a) Is $\{X_t\}$ weakly stationary? Why or why not?
 - (b) Let $Y_t = X_t - 4t$. Is $\{Y_t\}$ weakly stationary? Why or why not?
 - (c) Let $W_t = Y_t - 2t$. Is $\{W_t\}$ weakly stationary? Show your work.
3. (4 marks) Let $\{Y_t\}$ be a stationary process with mean zero, variance $\gamma_0 = \sigma^2$ and autocovariance function $\gamma_k = \sigma^2 \left(-\frac{1}{2}\right)^k$.
 - (a) What is the autocorrelation function for $\{Y_t\}$?
 - (b) Using your answer in part (a), draw what you think the plot of Y_t vs. Y_{t-1} might look like. Explain your reasoning.
 - (c) Using your answer in part (a), draw what you think the plot of Y_t vs. Y_{t-2} might look like. Explain your reasoning.