Applied Geostatistics (G17604-01)

- Final Examination -

Student ID: **Name:**

Notice

- Solve all problems by hand or using a computer program.

- Scan your solution as *.pdf or *.word file and upload it on Cyber Campus before 12:00 PM on June 20, 2018.

- Follow the format that gives a name to your report or report file:
  (final)-(student ID)-(last name)
  For example, Seoyoon Kwon's filename must be final-181ERG01-Kwon.

- **NO** discussion is allowed in this take-home examination.

- Fill your name in the following:
  "I, _____, swear I solve all problems by myself in this final examination.
  I will take any disadvantages if any dishonesty such as cheating is acted on my solution."

Problem 1.

Explain the following schemes briefly:

    (1) Second order stationarity [3 pts.]
    (2) Weak second order stationarity [3 pts.]
   (3) Intrinsic hypothesis [3 pts.]
    (4) Ergodicity [3 pts.]

Problem 2.
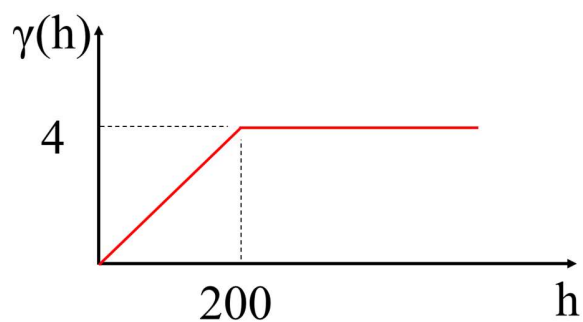
Let's assume you have n sample data points.

    (1) Derive the Kriging equation and the error variance for simple kriging [4 pts.].
    (2) Derive the Kriging equation and the error variance for ordinary kriging [4 pts.].
    (3) Derive the Kriging equation and the error variance for block kriging [4 pts.].
    (4) Derive the Kriging equation and the error variance for co-kriging [4 pts.].
    (5) Derive the Kriging equation and the error variance for co-block kriging [4 pts.].

Problem 3. [20 pts.]

You are given a variogram model, which is linear with the range of 200 and sill of 4 (i.e., $\gamma(h) = 4\text{Linear}_{200}(h)$). Estimate kriged values and its error variance values at z_4, z_5, and z_6 using simple kriging. Compare the estimates obtained using simple kriging with those obtained using ordinary kriging. Here, three sample values are as follows: $z_1 = 5$, $z_2 = 10$, and $z_3 = 15$. *Round any number off to the third decimal place for your calculation.*
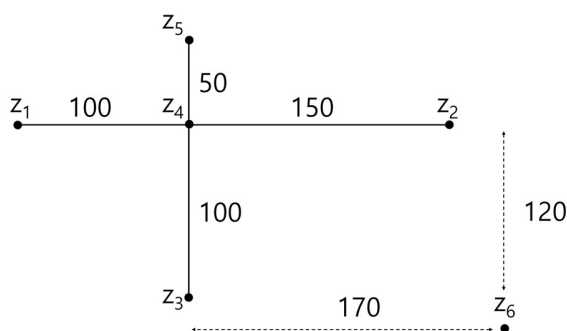
(a) Distribution of sample data z_1, z_2, and z_3 (b) Variogram model (linear)

Problem 4.

(1) Explain the Exactness of Kriging briefly [5 pts].

(2) Describe a procedure of cross validation in Kriging in brief [5 pts].

(3) Perform Cross Validation for the **Problem 3** using ordinary kriging. Is the Exactness of Kriging is guaranteed in cross validation? [5 pts].

Problem 5.

(1) Re-solve the Problem 3 using ordinary kriging with the following variogram model: [5 pts]

$\gamma(h) = 4\text{Linear}_{400}(h)$

(2) Re-solve the Problem 3 using ordinary kriging with the following variogram model: [5 pts]

$\gamma(h) = 8\text{Linear}_{200}(h)$

(3) Re-solve the Problem 3 using ordinary kriging with the following variogram model: [5 pts]

$\gamma(h) = 4\text{Sph}_{200}(h)$

(4) Re-solve the Problem 3 using ordinary kriging with the following variogram model: [5 pts]

$\gamma(h) = 4\text{Exp}_{200}(h)$

(5) Re-solve the Problem 3 using ordinary kriging with the following variogram model: [5 pts]

$\gamma(h) = 4\text{Gauss}_{200}(h)$

(6) Describe effects of variogram parameters based on your Kriging results [4 pts].

(7) Draw nugget, linear, exponential, and Gaussian variogram models with the range of a and sill of σ^2 [4 pts].

-------------------- This is the end of Final Examination for Applied Geostatistics. --------------------