**Write down codes in MATLAB, Python, C++ or any other language. Codes and/or Petrel project files and data outputs must be enclosed in the report.** Provide enough explanation, figures and tables.

Consider a cubic volume of 3700 meters in x direction and 3500 meters in Y direction, with locations given for different wells.

For given data set:

1) Explore vertical correlation of porosity and permeability,

2) Compute histograms and auto- and cross-variograms of porosity and permeability,

3) Fit different analytical variogram models to the experimental variograms calculated.

4) find the best model for permeability based on:

1. Regression method
2. Conditional expectation
3. Cloud Transform (one-dimensional p-field simulation)
4. Compare and contrast experimental models with different support volumes, determine the best fitting values for ranges in different directions,
5. Decide if there exist geometric anisotropy in data,
6. Determine proper values for size and direction of search ellipsoid,
7. Perform Sequential Gaussian Simulation to obtain create several realizationsbased on ordinary kriging and the simple kirging with locally varying mean(use LVM properties).
8. Perform Sequential Gaussian Co-simulation using the Secondary dataset.Select appropriate model among the Full cokriging, Markov-Bayes Model, giveproper explanation for your choice. Also explain how you do the lower andupper tail extrapolation.
9. Perform the Direct Sequential Gaussian Simulation to create realizations ofprimary variable, compare the results with outputs of SGS.
10. Create indicator variables from the primary variable with suitable choice ofthresholds.
11. Perform Sequential Indicator Simulation based on median or full IK. Explainhow and why the results are different from results of SGS.