

--	--	--	--	--	--	--	--	--	--

Eighth Semester B.E. Degree Examination, July/August 2022 Mining Geostatistics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Samples have been collected along a mineral lode, the details of which are given in table below. Determine average width and average grade. Table sampling of lode outcrop by trenches.

Sample location from start (m)	Lode width (cm)	Assay value (g/t)
5	3	200
19	5	302
25	4	270
37	3	415
47	4	360
55	3	290

- b. Explain inverse distance square method used in ore reserve with neat sketch.

(10 Marks)

(10 Marks)

OR

- 2 a. Derive formula for average grade, thickness and tonnage of ore using polygonal method.

(10 Marks)

- b. Compare triangular method of ore reserve estimation with polygonal method.

(10 Marks)

Module-2

- 3 a. Explain in detail independent random model with neat sketch.

(10 Marks)

- b. Explain in detail correlated random model with neat sketch.

(10 Marks)

OR

- 4 a. Given a random variable Fe in iron ore deposit, normally distributed with a mean of 50% and standard deviation of 10% calculate :

- Probability of Fe value being greater than 42%
- Probability of Fe value being greater than 55%
- Probability of Fe value being less than 40%
- Probability of Fe value lying in the range of 50.5% and 65.5%.

(10 Marks)

- b. Given an estimate of mean as 65% Fe and a standard deviation of 20% in an iron ore grade deposit, mine manager requires to know the proportion of iron ore
- above 63% Fe grade
 - between 63% and 68% Fe grade.

(10 Marks)

Module-3

- 5 a. Explain Semi-variogram with suitable sketch.

(05 Marks)

- b. Explain in brief the characteristics of a semi-variogram with sketch.

(15 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 Describe ten different theoretical semi-variogram models with sketches. (20 Marks)

Module-4

- 7 Explain extension and estimation variance. Derive the calculation of estimation variance and its effects when there is presence of nugget effect. (20 Marks)

OR

- 8 Define kriging and derive the kriging system for a block diagram two samples. (20 Marks)

Module-5

- 9 A massive lead-zinc deposit has been geostatistically evaluated which would be mined by employed an underground method. A mineral inventory has been developed for a deposit showing block tonnage, grades and variances. From the mineral inventory, the combined Pb-Zn grades have been tabled in categories as follows :

Grade % Pb-Zn Grade category	Average grade in category	Tonnage in category (mt)
0.0 – 5.0	2.5	5.0
5.0 – 7.0	6.0	4.0
7.0 – 9.0	8.0	5.0
9.0 – 11.0	10.0	6.0
11.0 – 13.0	12.0	8.0
13.0 – 15.0	14.0	10.0
15.0 – infinity	20.0	45.0

The ratio of Pb:Zn is estimated at 2:3 A preliminary investigation into the mining, processing and smelting has resulted in the following :

underground dilution of ore reserve 20%

Recovery of metal from run-of mine ore 80%

Overall cost per tonne of run-of-mine ore £ 32

Estimated price of lead £ 375/t

Estimated price of zinc £ 750/t

- i) Calculate a cut of grade based on the above information and
 ii) Estimate the grade and tonnage of ore that could be available for mining (20 Marks)

OR

- 10 Explain in detail the following with neat sketch.
 i) Hand fit method
 ii) Non-linear least squares fit method
 iii) Point kriging cross – validation method. (20 Marks)

* * * * *