浙江大学 2018－2019 学年 秋冬 学期

《 地理定理分析方法 》课程期末考试试卷

课程号：83120260，开课学院：地球科学学院

考试试卷：A 卷

考试形式：开卷，允许带 书本、纸质参考资料、计算器 入场

考试日期：2019 年 1 月 9 日，考试时间：150 分钟

诚信考试，沉着应考，杜绝违纪。

考生姓名：[redacted] 学号：_____ 所属院系：_____

题序	1	2	3	4	5	6	7	总 分
得分								
评卷人								

1. Simple Questions: (***13 Scores***)

(1) The following data represent stream link lengths (km) in a river network:

10, 42, 32, 47, 12, 15, 39, 35, 24, 33, 56.

Find the mean, mode, median, standard deviation of the link lengths, and covert the link lengths into *z*-scores. (***8 Scores***)

(2) The probability that region A is striked by typhoon every year is 0.2. What is the probability that this region receives typhoon in two consecutive year? (***5 Scores***)

2. The following analysis of variance table (ANOVA) table results from the regression of *y* on *x* for a particular dataset

(***10 Scores***)

	Sum of Squares	df	Mean Square	*F*
Regression	5000	1	5000	29.0
Residual	5000	29	172.4	
Total	10,000			

(1) Find r^2 (***5 Scores***)

(2) If the standard deviation of *x* is equal to 18, find the slope, *b*. (***5 Scores***)

3. The following data are collected in a region in an effort to determine whether rainfall is dependent upon elevation: (*20 Scores*)

Rainfall (mm)	Elevation (m)
86	122
128	244
58	61
99	206
108	187

(1) Find the regression coefficients (the intercept and the slope coefficient). (*4 Scores*)

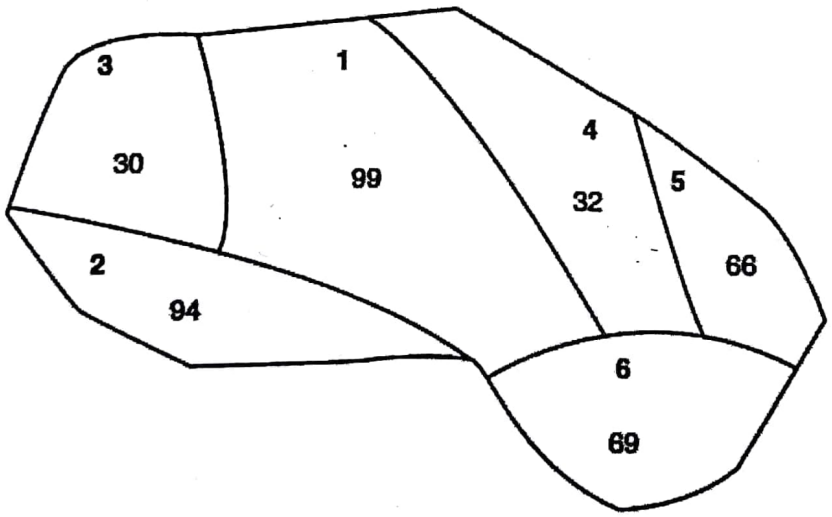
(2) Test the hypothesis that the regression coefficient associated with the independent variable is equal to zero. Also place a 95% confidence interval on the regression coefficient. (*4 Scores*)

(3) Make a table of the observed values, predicted values, and residuals. (*4 Scores*)

(4) Prepare an analysis of variance table portraying the regression results. (*4 Scores*)

(5) Graph the data and the regression line. (*4 Scores*)

4. A regression of a health index on GDP and Gini coefficient (a measure of income disparity among the residents of a country) leaves the following residuals across a series of nations:



Use Moran's *I* to determine whether there is a spatial pattern to the residuals, assuming binary connectivity for the weights. (*10 Scores*)

5. Using the Euclidean distance matrix of 4 variables, list clustering analysis process and plot clustering spectral chart. (*12 Scores*)

$$D_0 = \begin{pmatrix} 0 & & & \\ 1 & 0 & & \\ 2 & 1.5 & 0 & \\ 4 & 3 & 3.5 & 0 \end{pmatrix}$$

6. There are two companies (A and B) near a river, each outputs two categories of pollutants (p1 and p2) into the river. If the waste from each company has been processed before it is emitted into the river, the pollutants in the river can be reduced. Company A costs $18 to process per ton of waste, and each ton of waste processing reduces the amount of p1 by 0.10 tons and p2 by 0.45 tons. Company B costs $15 to process per ton of waste, and each ton of waste processing reduces the amount of p1 by 0.20 tons and p2 by 0.25 tons. The local government wants the 2 company to reduce the amount of p1 by at least 10 tons and p2 by at least 30 tons. Try to formulate a liner programming (LP) that minimizes the cost of reducing pollution by the desired amounts, and solve it. (***15 scores***)

7. Give the concept of artificial neural networks (ANNs) (**3 scores**), list the two main problems in ANNs (**5 scores**), discuss some (at least two) ANNs' applications in geography, in terms of research meaning, data source and data preprocessing methods, and the expected results (**12 scores**). (***20 scores***)