KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 123

STAT 319 Statistics for Engineers and Scientists

Final Exam Sunday July 28, 2013

Please check/circle your instructor's name

□ Anabosi □ Jabbar □ Al-Sabah □ Saleh □ Alsawi

Name: _____ ID #: _____Section# _____

☺ Important Note:

Show all your work

a) including formulas,
b) intermediate steps, and
c) Final answer.
d) In testing problems, write down
   i) The null and alternative hypotheses
   ii) The test statistic
   iii) The rejection region
   iv) The decision, and
   v) The conclusion

Question No	Full Marks	Marks Obtained
1	3	
2	5	
3	6	
4	7	
5	29	
Total	50	

1) An encryption-decryption system consists of three elements: encode, transmit, and decode. An encode error occurs in 0.9% of the messages processed, transmission errors occur in 1% of the messages, and a decode error occurs in 0.1% of the messages. Assume the errors are independent. What is the probability of a message with no errors?

(3 pts)

2) The width of a magnetic tape (*in cm*) is a continuous variable over the range $0 < x < 2$ with density $f(x) = \frac{x}{2}$

a) Find the mean width. *(1 pt)*

b) Find the standard deviation of the width. *(2 pts)*

c) Find the probability that a randomly selected tape has width between *1 and 1.5 cms.* *(2 pts)*

3) The life of a machine is normally distributed with a mean of 7 years, and a standard deviation of 2 years.

a) What is the probability that the life of a random machine falls between 6.40 and 7.50 years? *(4 pts)*

b) How many years do 15 % of the machines live longer than? *(2pts)*

4) Five specimens of a ferrous-type substance are to be used to determine if there is a difference between chemical analysis and X-ray analysis of the iron content. Each specimen was split into two parts and the two types of analysis were applied. Following are the results of the analyses.

		Specimen				
		1	2	3	4	5
Analysis	X-ray	2	2	2.3	2.1	2.4
	Chemical	2.2	1.9	2.5	2.3	2.4

Test at the 0.05 level of significance whether the two methods of analysis give, on the average, the same result. *(7 pts)*

5) Consider the following study about the relationship between the amount of Nickel (the regressor) and the volume percent Austenite in various steels. The objective is to build a simple linear regression model.

13 observations were collected, some are given in the table below.

X	0.60	0.63	0.65	0.66	…	0.71	0.73	0.75	0.77	0.80	0.81
Y	2.11	1.95	2.27	1.95	…	2.51	2.33	2.26	2.47	2.8	2.95

Use $\sum_{i=1}^{13} x_i = 9.2, \quad \sum_{i=1}^{13} y_i = 30.3, \quad \sum_{i=1}^{13} x_i^2 = 6.6, \quad \sum_{i=1}^{13} y_i^2 = 71.8, \quad \sum_{i=1}^{13} x_i y_i = 21.7$

Show your answers to two decimal places <u>ONLY</u>

a) State the model assumptions *(3 pts)*

b) Find the least squares regression line. *(3 pts)*

c) Estimate the variance of the error. *(2pts)*

d) At the 5% significance level determine if the amount of percent Austenite increases with amount of Nickel. *(6 pts)*

e) Estimate the percent of Austenite when the amount of Nickel is 0.80. *(1 pt)*

f) Estimate the error when the level of Nickel is 0.80. *(1 pt)*

g) Estimate the slope of the regression line by a 95% interval. *(3 pts)*

h) Interpret the meaning of the interval in g). *(1 pt)*

i) Based on the interval in g), is the regression significant? Justify your answer. *(2 pts)*

j) Calculate a 95% prediction interval for percent of Austenite given the amount of Nickel is 0.80. *(3 pt)*

k) Find the value of the correlation coefficient and interpret its meaning. *(2 pts)*

l) Find the value of the coefficient of determination and interpret its meaning. *(2 pts)*