KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 131

STAT 319 Statistics for Engineers and Scientists

Final Exam Tuesday January 7, 2014

Please check/circle your instructor's name

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

Name: _____ ID #: _____Section# _____

☺Important Notes:

- Show all your work including formulas, intermediate steps and final answer.
- In hypothesis testing problems, write the null and the alternative hypotheses, test statistic, decision rule, critical values, and your conclusion, unless otherwise is specified.

Question No	Full Marks	Marks Obtained
1	5	
2	4	
3	3	
4	4	
5	9	
6	7	
7	23	
Total		

1) A traffic Control engineer reports that 70% of the vehicles passing travelling on the King Fahd Causeway are from Saudi Arabia.
   a) What is the probability that fewer than 8 of the next 9 vehicles are from Saudi Arabia? *(3pts.)*

   b) If the engineer expects 240 vehicles to pass through, what is the expected number of vehicles from Saudi Arabia? *(1pt.)*

   c) What is the probability that the first vehicle to pass from Saudi Arabia is the third one checked, if vehicles are checked one by one? *(1pt.)*

2) Silicon wafers are used in the manufacture of integrated circuits. Of the wafers manufactured by a certain process, 10% have resistances below specification and 5% have resistances above specification.
   a) What is the probability that the resistance of a randomly chosen wafer does not meet the specification? *(2pts.)*

   b) If a randomly chosen wafer has a resistance that does not meet the specification, what is the probability that it is too low? *(2pts.)*

3) A particular industrial product is shipped in lots of 20. The manufacturer samples five items from each lot and rejects the lot if more than one defective is observed. If a lot contains four defectives, what is the probability that it will be accepted? *(3pts.)*

4) A scientist interested in monitoring chemical contaminants in food, selected a random sample size of *25* male adults. It was found that the average daily intake of dairy products was *756* grams per day with a standard deviation of *35* grams per day.
   a) Use this sample information to construct a 95% confidence interval for the mean daily intake of dairy products for men. *(3pts.)*

   b) Do you need any assumptions? If yes, what? If no, why? *(1pt.)*

5) It is believed that more than 60% of the residents in a certain area favor the building of a nuclear reactor.
   a) What conclusion would you draw if only 110 in a sample of 200 residents favor the building proposal? Use a 0.05 level of significance. *(6pts.)*

   b) How large a sample is needed if we wish to be 98% confident that our sample proportion will be within 0.05 of the true proportion of the residents who favor building the reactor, in the case of no prior estimate of the proportion is available? *(3pts.)*

6) The lifetimes of electrical appliances produced from an assembly line have the exponential distribution with a *mean of* 10 years.
   a) What is the probability that a randomly selected appliance will survive ***at least*** 15 years? *(3pts.)*

   b) If a sample of size 100 appliances was selected, what is the probability that the ***total*** lifetimes of the 100 appliances will *exceed* 1050 years?

7) The following sample observations have been obtained by a chemical engineer investigating the relationship between weight of final product Y (in pounds) and volume of raw materials X (in gallons):

X	14	23	9	17	10	22	5	12	6	16
Y	68	105	40	79	81	95	31	72	45	93

$\sum x = 134$, $\sum x^2 = 709$, $\sum y = 2140$, $\sum y^2 = 55895$, $\sum xy = 10747$

   a) Plot the given data, and comment on it. *(2pts.)*

b) Use the method of least squares to determine the expression of the estimated regression line. *(3pts.)*

c) Plot the line on the scatter plot in a). *(1pt.)*

d) Compute the sample standard deviation for final product weight. *(1pt.)*

e) Compute the standard error of the estimate for final product weight. *(2pts.)*

f) Compute the sample correlation coefficient and interpret its meaning. *(2pts.)*

g) What is the relationship between the sample correlation coefficient and the slope of the regression line? *(1pt.)*

h) What percentage of variation in the final product weight is explained by the volume of raw material? What do you conclude? *(2pts.)*

i) At the 10% significance level, test whether the volume of raw material and weight of final product are related? *(5pts.)*

j) Construct a 95% confidence interval estimate of the mean final product weight when the volume of raw material is 25 gallons? *(3pts.)*

k) Can you estimate the error in mean final product weight when the volume of raw material is 25 gallons? If yes, what is the estimate? If no, why?