KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 162

STAT 319 Statistics for Engineers and Scientists

Tuesday Match 28, 2017

Please circle your instructor's name:

R. Anabosi M. Almomani E. Alsawi M. Riaz W. Al- Sabah M. Saleh

Name: _____ ID #:_____

Important Note:

- Show all your work including formulas, intermediate steps and final answer

Question No	Full Marks	Marks Obtained
1	11	
2	11	
3	7	
4	6	
5	6	
6	6	
7	5	
8	8	
Total	60	

1) An engineer is interested in comparing the iron content of real metal with the iron content of a metal substitute. The data for two random samples are shown. Compare the distributions, using boxplots.

real metal	40	45	90	180	220	240	310	420
metal substitute	130	180	250	260	270	290	310	340

Box-plot for real metal	*4 marks*
Box-plot for metal substitute	*4 marks*
Comparison	*3 marks*

2) The following data represent the annual maintenance costs (in $1000) for 25 heavy construction equipment:

17	19	20	21	21	24	25	25	25	25
26	27	28	30	30	31	31	31	32	32
34	36	40	41	50					

a) Construct a histogram using intervals of width 5000 dollars, with 15000 dollars as lower limit of the first interval. *3 marks*

b) Approximate the mean annual maintenance cost from the histogram. *3 marks*

c) Examine the shape of the data. *1 mark*

d) Based on the shape of the maintenance cost data which is the most appropriate measure of center? *1 mark*

e) Find the 80^{th} percentile, and explain its meaning in the context of the problem. *3 marks*

3) Suppose the probability that component A of a machine will work for 10 more years is 0.8 and the probability that component B of the same machine will work for 10 more years is 0.85. Assume that components A and B work independently. Find the probability that

a) A and B work for 10 more years. *2 marks*

b) At least one of these two components works 10 more years. *2 marks*

c) Exactly one of these components works 10 more years. *3 marks*

4) Vehicles are subjected to test of emission standards and the test is not perfect. A company has 15 delivery trucks where 6 of them do not meet emission standards. If the test detects violation of emission standards 90% of the time and falsely detects violation of emission standards 5% of the time, answer the following:

a) If a truck is randomly selected, what is the probability that it was detected violating the emission standards? *3 marks*

b) What is the probability that, a randomly selected truck, is meeting the standards given that it was detected, by the test, violating the emission standards? *3 marks*

5) A certain typing agency employs two typists. The average number of errors per article is 3.0 when typed by the first typist and 4.2 when typed by the second. Assume that the number of errors follows a Poisson distribution.

a) What is the probability of having five errors in two articles typed by the first typist? *3 marks*

b) If your article is equally likely to be typed by either typist. Find the probability that it will have no errors. *3 marks*

6) Suppose that the percentage of defective fuses from a production line is 10%. If four fuses are randomly selected. Find:

a) The probability that at least one is defective. *2 marks*

b) Suppose that the four sampled fuses were shipped to a customer before being tested. Assume that the cost of repair is given by $Cost = 3x^2$, where X, denotes the number of defectives in the shipment. Find the expected repair cost. *4 marks*

7) In a city, it is estimated that the maximum temperature in June is normally distributed with a mean of 23º and a standard deviation of 5°. Calculate the number of days in June in which the temperature is expected to be between 21° and 27°. *5 marks*

8) The amount of time that a surveillance camera will run without having to be reset is a random variable having the exponential distribution with mean 50 days.

a) Find the probability that such a camera will have to be reset in less than 20 days. *2 marks*

b) Find the probability that such a camera will not have to be reset in at least 60 days. *3 marks*

c) Find the amount of time that refers to the first quartile, and interpret what it means. *3 marks*