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

STAT 319 Statistics for Engineers and Scientists

First Major Exam Monday September 30, 2013

Please check/circle your instructor's name

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

Name: _____ ID #: _____Section# _____

☺Important Note:

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

Question No	Full Marks	Marks Obtained
1	5	
2	6	
3	4	
4	4	
5	6	
Total	25	

Some Useful Formulas

- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$, $P(B) > 0$
- $P(E_1 \mid B) = \dfrac{P(B \mid E_1) P(E_1)}{P(B \mid E_1) P(E_1) + \cdots + P(B \mid E_k) P(E_k)}$ for $P(B) > 0$
- $f(x) = \binom{n}{x} p^x (1-p)^{n-x}$, $x = 0, 1, 2, \ldots, n$
- $f(x) = \dfrac{\binom{N-K}{n-x}\binom{K}{x}}{\binom{N}{n}}$, $x = 1, 2, \cdots, \min(n, K)$
- $f(x) = p\,(1-p)^{x-1}$, $x = 1, 2, \ldots$
- $f(x) = \dfrac{e^{-\lambda} \lambda^x}{x!}$, $x = 0, 1, 2, \cdots$

1) A critical automobile part is inspected by three different inspectors having rejection rates of 0.10, 0.08, and 0.12, respectively. The inspections are independent and sequential such that if a part is rejected by one inspector it is immediately removed.

   a) What is the probability that a part never reaches the third inspector? *(3 pts.)*

   b) What is the probability that a part is rejected by the third inspector? *(2 pts.)*

2) A chemical supply company ships a certain solvent in 10–gallon drums. Let X represent the number of drums ordered by a randomly chosen customer. Assume X has the following probability mass function:

x	1	2	3	4
$P(X = x)$	0.4	0.2	0.3	0.1

   a) Find the cumulative distribution function of X. *(4 pts.)*

   b) Find the mean number of gallons ordered. *(2 pts.)*

3) There is a 10% chance that an electric fuse is defective. A quality controller picks 4 fuses at random from a large batch and tests each one.
   a) What is the probability of finding at least one defective fuse? *(2pts.)*

   b) What is the probability that the first defective fuse is the last one tested? *(2pts.)*

4) The number of oil tankers arriving at a certain refinery each day has a Poisson distribution with rate equal to 2. Present port facilities can service three tankers a day. If more than three tankers arrive in a day, the tankers in excess of three must be sent to another port. On a given day what is the probability of having to send tankers away? *(4pts.)*

5) A manufacturer of air-conditioning units purchases 70% of its thermostats from company *A*, 20% from company *B*, and the rest from company *C*. Past experience shows that 0.5% of company *A*'s thermostats, 1% of company *B*'s thermostats and 1.5% of company *C*'s thermostats are likely to be defective. An air-conditioning unit is randomly selected from this manufacturer's production line.

a) Find the probability that the selected thermostat is defective. *(4pts.)*

b) Find the probability that company *A* supplied the defective thermostat. *(2pts.)*