The University of Jordan School of Engineering Industrial Engineering Department	الجامعة الاردنية كلية الهندسة قسم الهندسة الصناعية	

(Midterm) Exam
Form D
First Semester 2018/2019

26

Course Title: Engineering Statistics I **Course No.**: IE0936251
Instructor: Dr. Mazen Arafeh
Date: October 31, 2018 **Time: 90 minutes**

Student Name	ID#	Section
		ay

Problem No.						Q6 (points)
Course outcome (a-k) (for questions selected for ABET assessment)				a		
Problem Grade				1		

D B C B D A C B C A B B B B

Dr. Mazen Arafeh

Question 1.

(a) Determine the constant c so that the following function is a probability mass function: $f(x) = cx$ for $x = 3, 4, 5, 6$.

A. 0.0714	B. 0.1000	C. 0.1667	D. 0.0556	E. None of the above

(b) Determine the most likely value of X.

A. 3.8556	B. 4.7816	C. 3.0000	D. 2.3338	E. None of the above

Question 2. Each main bearing cap in an engine contains 4 bolts. The bolts are selected at random without replacement from a parts bin that contains 35 bolts from one supplier and 65 bolts from another.

(a) What is the probability that a main bearing cap contains all bolts from the same supplier?

A. 0.1727	B. 0.0134	C. 0.1861	D. 0.3132	E. None of the above

(b) What is the probability that exactly 3 bolts are from the same supplier?

A. 0.0725	B. 0.4984	C. 0.1085	D. 0.3899	E. None of the above

Question 3. Consider the lengths of stay at the Jordan University Hospital's emergency department in Amman. The probability that a person's length of stay is ≤ 4 hours is 0.70. Assume that four persons independently arrive for service.

(a) What is the probability that the length of stay of exactly one person is less than or equal to 4 hours?

A. 0.1536	B. 0.2005	C. 0.1115	D. 0.0756	E. None of the above

(b) What is the probability that exactly two people wait more than 4 hours?

A. 0.2646	B. 0.3105	C. 0.3456	D. 0.3675	E. None of the above

(c) What is the probability that at least one person waits more than 4 hours?

A. 0.9085	B. 0.8704	C. 0.7599	D. 0.8215	E. None of the above

Question 4. The number of surface flaws in plastic panels used in the interior of automobiles has a Poisson distribution with a mean of 0.05 flaw per square foot of plastic panel. Assume that an automobile interior contains 6 square feet of plastic panel.

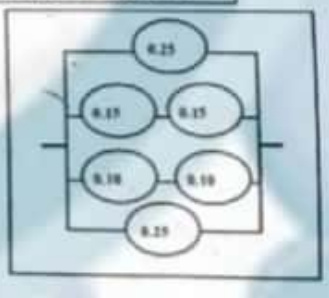
(a) What is the probability that there are no surface flaws in an auto's interior?

A. 0.0488	B. 0.7408	C. 0.9512	D. 0.2592	E. None of the above

(b) If 6 cars are sold to a rental company, what is the probability that none of the 6 cars has any surface flaws?

A. 0.2865	B. 0.0067	C. 0.0003	D. 0.1653	E. None of the above

Question 5. The following circuit operates if and only if there is a path of functional devices from left to right. Assume that devices fail independently and that the probability of failure of each device is as shown. What is the probability that the circuit does not operate?



A. 0.0033	B. 0.2500	C. 0.5346	D. 0.0605	E. None of the above

Question 6. Suppose that $f(x) = e^{-x}$ for $x > 0$. Determine the following:

(a) $P(4 < X)$

A. 0.3679	B. 0.0183	C. 0.0498	D. 0.1353	E. None of the above

(b) $P(4 \leq X)$

A. 0.3679	B. 0.0183	C. 0.8647	D. 0.1353	E. None of the above

(c) $P(X = 4)$

A. 0.0001	B. 0.0000	C. 0.3679	D. 1.0000	E. None of the above

(d) x such that $P(x < X) = 0.40$

A. 2.3026	B. 0.9163	C. 1.6094	D. 1.0000	E. None of the above

TABLE • I Summary of Common Probability Distributions

Name	Probability Distribution	Mean	Variance
Discrete			
Uniform	$\frac{1}{n}, a \le b$	$\frac{(b+a)}{2}$	$\frac{(b-a+1)^2-1}{12}$
Binomial	$\binom{n}{x} p^x (1-p)^{n-x}$ $x = 0, 1, \ldots, n, 0 \le p \le 1$	np	$np(1-p)$
Geometric	$(1-p)^{x-1} p$ $x = 1, 2, \ldots, 0 \le p \le 1$	$1/p$	$(1-p)/p^2$
Negative binomial	$\binom{x-1}{r-1}(1-p)^{x-r} p^r$ $x = r, r+1, r+2, \ldots, 0 \le p \le 1$	r/p	$r(1-p)/p^2$
Hypergeometric	$\frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}}$ $x = \max(0, n-N+K), 1, \ldots$ $\min(K, n), K \le N, n \le N$	np where $p = \frac{K}{N}$	$np(1-p)\left(\frac{N-n}{N-1}\right)$
Poisson	$\frac{e^{-\lambda}\lambda^x}{x!}, x = 0, 1, 2, \ldots, 0 < \lambda$	λ	λ