中山大学软件学院 **2009** 级软件工程专业(2010学年秋季学期)

《SE-203 概率统计》期末试题(A卷)

(考试形式：闭　卷　　考试时间：2 小时)

警示

《中山大学授予学士学位工作细则》第六条

考试作弊不授予学士学位

方向：_____　　姓名：_____　　学号：_____

1. (15) The number of cars that went through a car wash during the noon hour over each of the past 8 days are shown as follows:

6　3　9　6　6　5　4　1.

Compute the following values for these sample:
mean $\bar{x}$, median $\tilde{x}$, fourth spread f_s (f_s = upper fourth - lower fourth), variance s^2, and the standard deviation s.

2. (15) An advertising executive is studying television viewing habits of married men and women during prime-time hours. On the basis of past viewing records, the executive has determined that during prime time, husbands are watching television 60% of the time. It has also been determined that when the husband is watching television, 40% of the time the wife is also watching. When the husband is not watching television, 30% of the time the wife is watching television. Find the probability that
(a) the wife is watching television in prime time.
(b) if the wife is watching television, the husband is also watching television.

3. (10) The number x of people who arrive at a cashier's counter in a bank during a specified period of time exhibits a Poisson probability distribution. Suppose you estimate that the average arrival rate is one person per minute.
(a) What is the probability that in a given minute the number of arrivals will equal 3 ?
(b) What is the probability that at most 2 people arrive in a 2-minute period ?

4. (15) The Nelson Company makes the machines that automatically dispense soft drinks into cups. Many national fastfood chains such as McDonald's and Burger King use these machines. A study by the company shows that the actual volume of soft drink that goes into a 16-ounce cup per fill is normally distributed with a mean of 16 ounces and a standard deviation of 0.35 ounces. A new 16-ounce cup that is being considered for use actually holds 16.7 ounces of drink.
(a) Calulate the proportion of cups that will be "overfilled" by the automatic dispenser.
(b) The company wishes to adjust the dispenser so that the overfill percentage is no greater than 0.5%. Determine the mean required to fulfill this wish.
(c) If the mean is set at 16 ounces, calculate the standard deviation that would be required to meet the stipulation in part (b).

5.(15) Let the joint pdf for (X,Y) be

$$f(x,y)=\begin{cases} A(x+y), & 0\le x\le 1, 0\le y\le 1 \\ 0, & otherwise \end{cases}$$

(a) What is the value of A ?
(b) Compute the covariance for X and Y.
(c) Are X and Y independent rv's?

6. (20) Let $X_1, X_2,\ldots,X_n$ be a random sample from a distribution X, which has the probability density function

$$f(x;\lambda)=\begin{cases} 2\lambda x\cdot e^{-\lambda x^2}, & x>0 \\ 0, & x\le 0 \end{cases}$$

(a) Compute EX^2, then obtain a moment estimator of λ.
(b) Obtain the maximum likelihood estimator of λ.

7. (10) A stationery store wants to estimate the average retail value of greeting cards that it has in its inventory. A random sample of 20 greeting cards indicates an average value of \$1.67 and a standard deviation of \$0.32. Assuming a normal distribution, set up a 95% confidence interval estimate of average value of all greeting cards in the store's inventory.

Solution:

Table 1: Standard Normal Curve Areas (*cont.*) $\Phi(x)=\int_{-\infty}^{x}\frac{1}{\sqrt{2\pi}}e^{-\frac{t^2}{2}}dt \quad (x\ge 0)$

x	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
1.8	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96926	0.96995	0.97062
1.9	0.97128	0.97193	0.97257	0.9732	0.97381	0.97441	0.975	0.97558	0.97615	0.9767
2	0.97725	0.97778	0.97831	0.97882	0.97932	0.97982	0.9803	0.98077	0.98124	0.98169
2.1	0.98214	0.98257	0.983	0.98341	0.98382	0.98422	0.98461	0.985	0.98537	0.98574
2.2	0.9861	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.9884	0.9887	0.98899
2.3	0.98928	0.98956	0.98983	0.9901	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.4	0.9918	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.5	0.99379	0.99396	0.99413	0.9943	0.99446	0.99461	0.99477	0.99492	0.99506	0.9952
2.6	0.99534	0.99547	0.9956	0.99573	0.99585	0.99598	0.99609	0.99621	0.99632	0.99643

Table 2: Critical Values for t Distribution $P\{T > t_{\alpha,n}\}=\alpha$

n \ α	0.1	0.05	0.025	0.01	0.005
1	3.0777	6.3138	12.7062	31.8205	63.6567
2	1.8856	2.9200	4.3027	6.9646	9.9248
3	1.6377	2.3534	3.1824	4.5407	5.8409
18	1.3304	1.7341	2.1009	2.5524	2.8784
19	1.3277	1.7291	2.0930	2.5395	2.8609
20	1.3253	1.7247	2.0860	2.5280	2.8453
21	1.3232	1.7207	2.0796	2.5176	2.8314