中 山 大 学 软 件 学 院 软 件 工 程 专 业 **2009** 级 (2010 学年秋季学期)

《SE-203 概率统计》 期 末 试 题 参 考 答 案 (A)

1. (15)

$\bar{x} = 5$

$\tilde{x} = 5.5$

$$f_s = \frac{6+6}{2} - \frac{3+4}{2} = 2.5$$

$s^2 = 5.714286$

$s = 2.390457$

2. (15)

(a) $P(W) = 0.6 \times 0.4 + 0.4 \times 0.3 = 0.36$;

(b) $P(H \mid W) = \dfrac{0.6 \times 0.4}{0.36} = \dfrac{2}{3} = 0.667$.

3. (10)

(a) P(in a given minute the number of arrivals will equal 3)

$= \dfrac{1^3}{3!} \cdot e^{-1} = \dfrac{1}{6e} = 0.061313$;

(b) P(at most 2 people arrive in a 2-minute period)

$= \dfrac{2^0}{0!} \cdot e^{-2} + \dfrac{2^1}{1!} \cdot e^{-2} + \dfrac{2^2}{2!} \cdot e^{-2} = \dfrac{5}{e^2} = 0.676676$.

4. (15)

(a) $P\{X \geq 16.7\} = 1 - \Phi\left(\dfrac{16.7 - 16}{0.35}\right) = 1 = \Phi(2) = 0.02275$.

(b) Suppose that the mean required is μ_0.

Since $0.005 = P\{X \geq 16.7\} = 1 - \Phi\left(\dfrac{16.7 - \mu_0}{0.35}\right)$,

we have $\mu_0 = 16.7 - \Phi^{-1}(0.995) * 0.35 = 15.79846$.

(c) Suppose that the mean required is σ_0.

Since $\mathbf{0.005}=P\{X \geq \mathbf{16.7}\} = \mathbf{1} - \Phi\left(\frac{\mathbf{16.7}-\mathbf{16}}{\sigma_0}\right)$,

we have $\sigma_0 = \frac{\mathbf{0.7}}{\Phi^{-1}(\mathbf{0.995})} = 0.271757$.

5.(15)

(a) A =1;

(b) $EX = \int_0^1\int_0^1 x(x+y)dxdy = \frac{7}{12}$,

$$EY = \int_0^1\int_0^1 y(x+y)dxdy = \frac{7}{12} ,$$

$$EXY = \int_0^1\int_0^1 xy(x+y)dxdy = \frac{1}{3} ,$$

$$Cov(X,Y) = EXY - EXEY = -\frac{1}{144} .$$

(c) Since $Cov(X,Y) \neq 0$, X and Y are not independent.

6. (20)

(a) $EX^2 = \int_0^{+\infty} x^2 \cdot 2\lambda x \cdot e^{-\lambda x^2} dx = \frac{1}{\lambda}$,

$$\hat{\lambda}_{ME} = \frac{1}{\frac{1}{n}\sum_{i=1}^{n} X_i^2} .$$

(b) Likelihood function: $L = \prod_{i=1}^{n} 2\lambda x_i \cdot e^{-\lambda x_i^2}$,

$$\ln L = n\ln 2 + n\ln\lambda - \lambda\sum_{i=1}^{n} x_i^2 ,$$

Likelihood equation: $\frac{\partial}{\partial\lambda}\ln L = \frac{n}{\lambda} - \sum_{i=1}^{n} x_i^2 = 0$,

The solution is $\lambda = \frac{n}{\sum_{i=1}^{n} x_i^2}$, The resulting MLE is $\widehat{\lambda}_{MLE} = \dfrac{n}{\sum_{i=1}^{n} X_i^2}$.

7. (10)

$$\left(\bar{x} - t_{\frac{\alpha}{2},n} \cdot \frac{s}{\sqrt{n}}, \bar{x} + t_{\frac{\alpha}{2},n} \cdot \frac{s}{\sqrt{n}}\right) = \left(1.67 - 2.093 \cdot \frac{0.32}{\sqrt{20}}, 1.67 + 2.093 \cdot \frac{0.32}{\sqrt{20}}\right) = (1.520237, 1.819763)$$