

QUIZ 4 STAT4352

Instruction: Each problem/question is of equal value (2 points).

1. Consider a joint pdf

$$f^{XY}(x, y) = Cy e^{-y(1+x)} I(x > 0)I(y > 0).$$

Find: (a) $E(X|Y = y)$. (b) $E(Y|X = x)$.

2. Consider a joint pdf

$$f^{XY}(x, y) = C(y + 2x)I(0 < x < y < 1).$$

Find: (a) $E(X|Y = y)$. (b) $E(Y|X = x)$.

3. Three types of batteries A,B and C are tested by three laboratories.

Times until failure are as follows:

A: 10, 12, 14.

B: 8, 10, 12.

C: 12, 14, 16,

Use $\alpha = .01$ and $\alpha = .05$ to test the null hypothesis that these batteries have the same mean failure time.

4. 14 measurements of the level of alcohol are:

46, 54, 53, 40, 53, 60, 52, 45, 49, 57, 66, 47, 59, 59.

The limit is 50, and there is a historical opinion that this is the median level. Conduct a reasonable one-tailed sign-test. Use $\alpha = .1$, and test your conjecture using: (a) Binomial Table. (b) Normal approximation.

5. The numbers of accidents are:

14, 10, 14, 16, 12, 11, 17, 16, 17, 7, 6, 12, 14, 14, 15, 15, 20.

A historical data states that the median number of accidents is 13. The police believes that the historical opinion is incorrect due to changes in traffic-control systems. Propose a one-tailed test. Consider $\alpha = .2$ and test the conjecture using: (a) Binomial Table. (b) Normal approximation.

6. Consider a linear regression problem based on n pairs of observations $\{(Y_l, X_l), l = 1, \dots, n\}$ with Y and X being response and predictor, respectively. Consider a least square linear regression approach and prove the classical anova relation $SST = SSR + SSE$ with mentioning an identical relation for corresponding degrees of freedom. Hint: write down a system of normal equations, then write down definitions for SST , SSR and SSE , and then use the normal equations to prove the ANOVA relation.