

HAIGAZIAN UNIVERSITY
Mathematics Department

15

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Mat 233 Quiz 2

Dec 20/05

Time: 75 mins

Name:-----

Part 1

Do this part on the answer booklet.

(20%) 1. X and Y are discrete random variables with the joint distribution

X	1	3	4
Y 1	0.15	0.15	0.14
2	0.08	0.18	0.30

- a) Find the marginal distributions.
- b) Find μ_X and μ_Y .
- c) Find σ_X^2 and σ_Y^2 .
- d) Find the variance of $Z = X - Y$.

??
 (15%) 2. The lifetime of a small electrical motor in years is a random variable X with the p.d.f $f(x) = \begin{cases} x e^{-x^2}, & x > 0 \\ 0, & \text{otherwise} \end{cases}$ $\rightarrow e^{-x^2}$

- a) Find the probability that a motor lasts less than one year.
- b) Compute the median lifetime.
- c) Find the c.d.f.

??
 (20%) 3. X and Y have the joint p.d.f

$$f(x,y) = \begin{cases} 2, & x > 0, y > 0, x + y \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

- a) Are X and Y independent?
- b) Find $p(X < 2Y)$.
- c) Find μ_X and μ_Y .
- d) Find the correlation $\rho_{X,Y}$.

(10%) 4. a box contains 10 balls numbered 1 through 10. Two balls are to be selected at random without replacement, let X be the largest of the two selected numbers.

- a) What are the possible values of X? $2 \rightarrow 10$
- b) Find a formula for the p.m.f of X.

$\frac{x-1}{45}$

$\binom{10}{2} = \frac{10!}{2!8!} = \frac{10 \times 9}{2} = 45$. 9 possibilities to have the other ball smaller than the one selected

Part 2

Do this part on the question sheet.
Please circle the correct answer.

1. X has a mean of 2 and a variance of 6 . what is $E(X^2 + X + 1)$? $E(X^2) = 6 + 2^2 = 10$
a) 10 b) 12 **c) 13** d) 11 ~~e) none~~ $E(X^2) + E(X) + 1 = 10 + 2 + 1 = 13$

2. Let X and Y be the numbers obtained by throwing a pair of fair dice . what is $E(X - Y)$?

a) 1 b) 2 **c) 0** d) 3 e) none $\frac{1}{6}$

?? 3. A player bets on an event with probability of 0.4 and gets \$20 upon winning. How much should he/she pay to play the game if the game is to be fair?

a) \$10 b) \$ 8 c) \$ 5 d) \$ 18 e) none

4. Let X be any random variable with a given mean and variance. Let $Y = 2X + 4$. What is the correlation between X and Y?

~~a) 2~~ ~~b) 6~~ ~~c) 4~~ **d) 1** ? e) none $-1 \leq \frac{Cov(X, Y)}{\sigma_X \sigma_Y} \leq 1$

5. Which of the following is not necessarily true?

✓ a) A p.d.f ≥ 0 ✓ b) A c.d.f ≥ 0 ✓ c) $0 \leq c.d.f \leq 1$

✓ d) The c.d.f of a continuous variable is continuous .

e) $p(a < X < b) = p(a \leq X \leq b)$ for any variable X.

GOOD LUCK \$\$\$\$