MID-TERM EXAM QUESTIONS – 20192

Course: Probability and Statistics (MI2026). *Time*: 60 minutes

Question 1 (2.5 points) From a group of 3 excellent students, 4 good students, and 5 average students a committee of size 4 is randomly selected. Find the probability that the committee will consist of (a) One good student; (b) The good students are more than other types of students.

Question 2 (2.5 points) One box contains 5 products from machine A and 3 from machine B. It is known from past experience that 1% and 2% of the products made by each machine, respectively, are defective. Suppose that two products are randomly selected from the box. (a) What is the probability that one of them is defective? (b) If two products were chosen randomly and found to be defective, what is the probability that they were made by machine B?

Question 3 (2.5 points) Continuous random variable X has probability density function

$$f_X(x) = \begin{cases} cx(3-x), & 0 \le x \le 3, \\ 0, & \text{otherwise.} \end{cases}$$

(a) Find c?

(b) Find the cumulative distribution function of $Y = 2X - 5$.

Question 4 (2.5 points) BK plays a game, which assigns a number (Z) that is the continuous random variable with the density function

$$f_Z(z) = \begin{cases} \frac{1}{5}, & 0 \le z \le 5, \\ 0, & \text{otherwise.} \end{cases}$$

If the game assigns a number less than or equal to k, then he loses 10 dollar, on the other hand, if the game assigns a number larger than k, then he will gain 10 dollar. (a) Find the expected profit of the game. (b) Find the variance of the profit. (c) If you were to play this game 10 times, what is the probability that you gain 20 dollars?

Student's full name: .....

MID-TERM EXAM QUESTIONS – 20192

Course: Probability Theory (MI2026). *Time*: 60 minutes

Question 1 (2.5 points) From a group of 3 excellent students, 4 good students, and 6 average students a committee of size 4 is randomly selected. Find the probability that the committee will consist of (a) One good student; (b) The good students are more than other types of students.

Question 2 (2.5 points) One box contains 5 products from machine A and 4 from machine B. It is known from past experience that 1% and 2% of the products made by each machine, respectively, are defective. Suppose that two products are randomly selected from the box. (a) What is the probability that one of them is defective? (b) If two products were chosen randomly and found to be defective, what is the probability that they were made by machine A?

Question 3 (2.5 points) Continuous random variable X has probability density function

$$f_X(x) = \begin{cases} cx(5-x), & 0 \le x \le 5, \\ 0, & \text{otherwise.} \end{cases}$$

(a) Find c?

(b) Find the cumulative distribution function of $Y = 3X - 7$.

Question 4 (2.5 points) BK plays a game, which assigns a number (Z) that is the continuous random variable with the density function

$$f_Z(z) = \begin{cases} \dfrac{1}{6}, & 0 \le z \le 6, \\ 0, & \text{otherwise.} \end{cases}$$

If the game assigns a number less than or equal to k, then he loses 10 dollar, on the other hand, if the game assigns a number larger than k, then he will gain 10 dollar. (a) Find the expected profit of the game. (b) Find the variance of the profit. (c) If you were to play this game 10 times, what is the probability that you gain 20 dollars?

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