

## IŞIK UNIVERSITY, MATH 230 FINAL EXAM

<b>Q1</b>	<b>Q2</b>	<b>Student ID:</b>	<b>Row No:</b>
<b>Q3</b>	<b>Q4</b>		
<b>Last Name:</b>		<b>First Name:</b>	

1. ( 12 points) Sale prices of houses in a town is normally distributed with mean 230,000 TL and standard deviation 20,000 TL.

i. What is the probability of selling a house for a value greater than 260,000 TL?

ii. What is the probability of selling a house for a value less than 215,000 TL?





2. (12 points) The density (PDF) of a continuous random variable  $X$  is given by

$$f(x) = \begin{cases} a + bx^2 & \text{if } 0 < x < 1 \\ 0 & \text{else.} \end{cases}$$

If  $\mathbb{E}(X) = 3/5$  then

- i. find  $a$  and  $b$ ,

- ii. find its variance.

Student's Name : \_\_\_\_\_

3. (14 points) Consider 2 rooms, Room A and Room B. There are 3 women and 4 men in Room A and 5 women and 2 men in Room B. One of the persons in Room A randomly moves to Room B, but you don't see whether this is a man or woman. Then you randomly call a person from Room B and a woman comes out of the room. What is the probability that the person, who moved from A to B, was a man?



4. (12 points) Let  $X$  and  $Y$  be jointly continuous with the joint pdf

$$f(x) = \begin{cases} cxy^2 & \text{if } 0 \leq x \leq 1 \quad \text{and} \quad 0 \leq y \leq x \\ 0 & \text{else} \end{cases}$$

- i. Find the value of  $c$ .
- ii. Find the marginal pdf  $f_X$  of  $X$ .

<b>Q5</b>	<b>Q6</b>	<b>Student ID:</b>	<b>Row No:</b>
<b>Q7</b>	<b>Q8</b>		
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5. (12 points)
- In flipping a fair coin 23 times, what is the probability of all heads or all tails?
  - How many different messages can be sent by five dashes (-) and three dots (.)?
  - In an exhibition, 20 cars of the same style that are distinguishable only by their colors, are to be parked in a row, all facing a certain window. If four of the cars are blue, three are black, five are yellow, and eight are white, how many choices are there?



6. (14 points) My wallet contains either a 5TL bill or a 20TL bill (with equal likelihood), but I don't know which one. I add a 5TL bill. Later, I reach into my wallet (without looking) and remove a bill. It's a 5TL bill. There's one bill remaining in the wallet. What are the chances that it's a 5TL bill?

7. (12 points)

- i. At the pizzeria, a pizza sold has mushrooms with probability  $p = 2/3$ . On a day in which 100 pizzas are sold, let  $N$  equal the number of pizzas sold before the first pizza with mushrooms is sold. What is the PMF of  $N$ ? Derive its Formula. Hint: A pizza with mushrooms can be sold at any one of the occasion with the probability  $2/3$ , of course it is also possible that no mushroom pizza is sold during the day.

- ii. The CDF of the random variable  $X$  is given as:

$$F_X(x) = \begin{cases} 0 & \text{if } x \leq 1 \\ 1/4 & \text{if } 1 \leq x < 4 \\ 1/2 & \text{if } 4 \leq x < 9 \\ 1 & \text{if } x \geq 9. \end{cases}$$

Find the PMF and the expected value of  $X$ .

8. (12 points)

- i. A manufacturer of screws claims that only 3% of its screws are defective. A random sample of 24 screws is selected, what is the probability that two or more of the screws are defected?
- ii. Ahmet, Ali, and Fethi have a probability of passing this course with 0.67, 0.88, and 0.92 respectively. What is the probability exactly one of them passes?