ESE/EEO 306
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Name:_____

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Sample Midterm
Total Score: 36 points
All problems carry equal weight of 6 points each
Please show your work and justify your answers

1. A 5-card poker hand is said to be a full house if it consists of 3 cards of the same rank, and the other two cards of another same rank. What is the probability of being dealt a full house? Note that here the cards are drawn **without replacement**.

2. Urn I contains 10 white and 5 red balls. Urn II contains 3 white and 6 red balls. We select an Urn at random, draw a ball from it and find that it is red. What is the probability that it is drawn from Urn II? Note that the probability of selecting either Urn is 1/2.

3. Four fair coins are flipped. If the outcomes are assumed independent, find the probability mass function (PMF) of the number of heads obtained.

4. Phone calls arrive at a call center at a rate of 3 calls per minute. The number of calls is modeled as a Poisson random variable X.

   (a) Find the probability that the number of calls received in a 1-minute interval is **exactly** 2.

   (b) Find the probability that the number of calls received in a 1-minute interval is between 2 and 4, inclusive.

5. Buses arrive at a specified stop at 15-minute intervals starting at 7 am. That is, they arrive at 7:00, 7:15, 7:30, and so on. If a passenger arrives at the stop at a time that is uniformly distributed between 7:00 and 7:15, find the probability that he waits less than 5 minutes for a bus.

6. A continuous random variable X has the probability density function(PDF)

$$f_X(x) = \begin{cases} cx^2, & 0 \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

Find

(a) the constant c,

(b) the probability $P(1/3 \le X \le 2/3)$, and

(c) the cumulative distribution function (CDF) $F_X(x)$.

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