MID-TERM EXAM QUESTIONS – 20201
Course: Probability and Statistics (MI2020E). *Time*: 60 minutes

Question 1 (3.0 points) Suppose that 15 cards are selected at random from a regular deck of 52 playing cards.

(a) If it is known that one ace has been selected, what is the probability that at least two aces have been selected?

(b) If it is known that the ace of hearts has been selected, what is the probability that at least two aces have been selected?

Question 2 (2.0 points) A student who is trying to write a paper for a course has a choice of two topics, A and B. If the topic A is chosen, the student will order 2 books through interlibrary loan, while if the topic B is chosen, the student will order 4 books. The student feels that a good paper necessitates receiving and using at least half the books ordered for either topic chosen. If the probability that a book ordered through interlibrary loan actually arrives on time is 0.85 and books arrive independently of one another, which topic should the student choose to maximize the probability of writing a good paper?

Question 3 (2.0 points) A box contains 10 red balls, 15 white balls, and 5 blue balls. Suppose that 3 balls are selected at random one at a time and let X be the number of colors missing from the 3 selected balls. Determine the probability mass function of X.

Question 4 (3.0 points) A light bulb has a lifetime Y which is exponential distribution with parameter $\lambda = 0.5$/year. Define $Z = [Y]$, the largest integer in Y, (i.e. $[y] = 0$ for $0 \le y < 1$, $[y] = 1$ for $1 \le y < 2$ etc.)

(a) What is $P(Z = 1)$?

(b) If the bulb is still working after 2 years then it is replaced by a new one. Let W be the time that the bulb is in use. Find the cumulative distribution function of W.

Student's full name: ....

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Course: Probability and Statistics (MI2020E). *Time*: 60 minutes

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Question 1 (3.0 points) Suppose that 17 cards are selected at random from a regular deck of 52 playing cards.

(a) If it is known that one ace has been selected, what is the probability that at least two aces have been selected?

(b) If it is known that the ace of hearts has been selected, what is the probability that at least two aces have been selected?

Question 2 (2.0 points) A student who is trying to write a paper for a course has a choice of two topics, A and B. If the topic A is chosen, the student will order 4 books through interlibrary loan, while if the topic B is chosen, the student will order 2 books. The student feels that a good paper necessitates receiving and using at least half the books ordered for either topic chosen. If the probability that a book ordered through interlibrary loan actually arrives on time is 0.9 and books arrive independently of one another, which topic should the student choose to maximize the probability of writing a good paper?

Question 3 (2.0 points) A box contains 5 red balls, 10 white balls, and 15 blue balls. Suppose that 3 balls are selected at random one at a time and let X be the number of colors missing from the 3 selected balls. Determine the probability mass function of X.

Question 4 (3.0 points) A light bulb has a lifetime Y which is exponential distribution with parameter $\lambda = 0.6$/year. Define $Z = [Y]$, the largest integer in Y, (i.e. $[y] = 0$ for $0 \le y < 1$, $[y] = 1$ for $1 \le y < 2$ etc.)

(a) What is $P(Z = 1)$?

(b) If the bulb is still working after 2 years then it is replaced by a new one. Let W be the time that the bulb is in use. Find the cumulative distribution function of W.

Student's full name: ....