

NAME:
SECTION:

Midterm Exam 1
22s:39

This exam consists of 14 problems. Do all the problems. **Show all your work.**

1. Suppose a parallel system has three components A, B, and C, in a series, with the probability that each component functions equal to 0.9, 0.95, and 0.90 respectively. The probability that the system does not function is

- a. $1-(0.10)(0.05)(0.10)$
- b. $1-(0.90)(0.95)(0.90)$
- c. $(0.10)(0.05)(0.10)$
- d. $1-(0.10+0.05+0.10)$
- e. None of the above

2. Out of 100 coins one has heads on both sides. One coin is chosen at random and flipped two times. The probability to get two tails is

- a. 0.7425
- b. 0.2475
- c. 0.26
- d. 0.2475
- e. 0.2575
- f. None of the above

3. Homer is trying to start a nuclear reactor without breaking the switch first. If he breaks the switch, Homer has to replace it and try to start the reactor again. If the probability of breaking any switch is 0.2, what is the probability that Homer will break exactly one switch before starting the reactor?

- a. 0.04
- b. 0.16
- c. 0.80
- d. 0.84
- e. 0.96
- f. None of the above

4. The statistician of the Hawkeyes thinks that if Albert Young runs for more than one thousand yards this season, the team has 50% chance of winning the Big Ten conference. He also believes that if Albert does not run the thousand yards, the chances of winning are only 20%. If, according to this statistician, the probability of winning the conference is 0.41, what is the probability that Albert Young will run more than one thousand yards this season?

- a. 0.1
- b. 0.3
- c. 0.5
- d. 0.7
- e. 0.9
- f. None of the above

5. An urn contains ten marbles of which five are green, two are blue, and three are red. Three marbles are to be drawn from the urn, one at a time without replacement. What is the probability that all three marbles drawn will be green?

- a. 0.9808
- b. 0.3415
- c. 0.0833
- d. 0.0013
- e. 0.1459
- f. None of the above

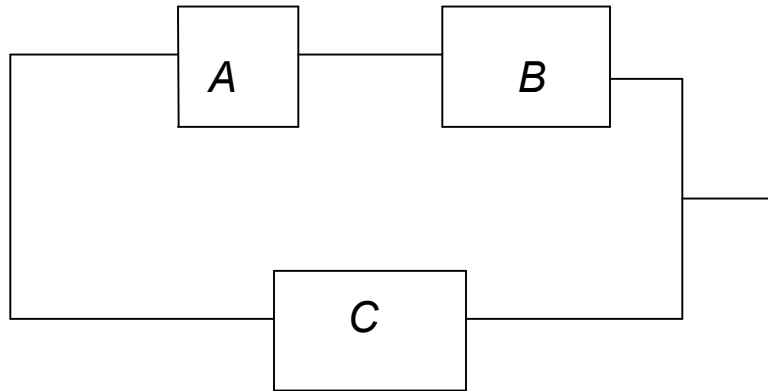
6. The number of flaws in a one-inch length of copper wire manufactured by a certain process varies from wire to wire. Overall, 45% of the wires produced have no flaws, 37% have one flaw, 12% have two flaws, and 6% have three flaws. Let X be the number of flaws in a randomly selected piece of wire. Then

$$P(X = 0) = 0.45, \quad P(X = 1) = 0.37, \quad P(X = 2) = 0.12, \quad P(X = 3) = 0.06$$

Let $F(x)$ denote the cumulative distribution function of the random variable X that represents the number of flaws in a randomly chosen wire. Find $F(-0.5)$.

- a. 0
- b. 0.82
- c. 0.37
- d. 0.94
- e. None of the above

7. A system consists of three components connected as shown in the following diagram.



Assume A, B, and C function independently. If the probabilities that A, B, C, fail are 0.10, 0.05, and 0.20, respectively what is the probability that the system functions?

The cumulative distribution function is shown below for the random variable X.

$$F(x) = \begin{cases} 0 & x < 0 \\ 0.20 & 0 \leq x < 0.75 \\ 0.60 & 0.75 \leq x < 1 \\ 0.80 & 1 \leq x < 2 \\ 1 & x \geq 2 \end{cases}$$

13. What is the $P(X = 0)$?

14. What is the $P(X \leq 1.5)$?