Sample Exam

Disclaimer: This is a for-practice-exam. The problems in the actual exam can be quite different from these, the underlying connection being the concepts and results discussed in class.

Problem 1.- A certain shop repairs both audio and video components. Let A denote the event that the next component brought in for repair is an audio component, and let B be the event that the next component is a compact disc player (so the event B is contained in A). Suppose that \( P(A) = .6 \) and \( P(B) = .05 \). What is \( P(B|A) \)?

Problem 2.- Four individuals have responded to a request by a blood bank for blood donations. None of them has donated before, so their blood types are unknown. Suppose only type O+ is desired and only one of the four actually has this type.

- If the potential donors are selected in random order for typing, what is the probability that at least three individuals must be typed to obtain the desired type?

- Find the probability that the third typed person is O+

Problem 3.- Suppose that the force acting on a column that helps to support a building is normally distributed with mean 15.0 kips and standard deviation 1.25 kips. What is the probability that the force:

- Is at most 18 kips?

- Is between 10 and 12 kips

- Differs from 15.0 kips by at most 2 standard deviations?

Problem 4.- Let \( X \) denote the temperature at which a certain chemical reaction takes place. Suppose that \( X \) has pdf

\[
f(x) = \begin{cases} 
\frac{1}{9}(4-x^2) & -1 \leq x \leq 2 \\
0 & \text{otherwise}
\end{cases}
\]

- Calculate the cdf of \( X \)
- Compute the moment generating function (mgf) of \( X \)
- Using the mgf, determine the mean and variance of \( X \)
- Find the density of the random variable \( Y=\ln(X) \)

Problem 5.- Grasshoppers are distributed at random in a large field according to a Poisson distribution with parameter \( \lambda = 2 \) per square yard. How large should the radius \( R \) of a circular sampling region be taken so that the probability of finding at least one in the region equals .99?