Department of Mathematics

Even 2018

Probability and Random Processes **15B11MA301**

Probability and Random Processes **10B11MA411**

Tutorial Sheet 4 **B.Tech. Core**

Discrete Probability Distributions

1. Differentiate between Binomial and Poisson distributions. Also derive the Expressions for mean, variance and MGF for these distributions.
2. Are the negative Binomial and Geometric distributions related? Describe with examples.
3. A communication system consists of n components, each of which will independently function with probability *p*. The total system will be able to operate effectively if at least one-half of its components function. For what values of *p* is a 5-component system more likely to operate effectively than a 3-component system?
4. A space craft has 100,000 components. The probability of any one component being defective is 2×10^{-5}. The mission will be in danger if five or more components become defective. Find the probability of such an event.
5. A shipment of 100 tape recorders contains 25 that are defective. If 10 of them are randomly chosen for inspection, what is the probability that 2 of the 10 will be defective?
6. In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson law for the number of errors per page, find the probability that a random sample of 5 pages will contain no error.
7. A boy is throwing stones at a target, what is the probability that his 10^{th} throw is his 5^{th} hit, if the probability of hitting the target at any trial is 0.05.
8. If the probability that a certain test yields a positive reaction equals 0.4, what is the probability that fewer than 5 negative reactions occur before the first positive one?
9. An experimental trial is performed until the first success is achieved. Assuming that the experiments are independent and the probability of success is *p*, find the value of *p* so that the probability that an odd number of experiments are required is equal to 0.6.
10. The number of blackflies on a board bean leaf follows a Poisson distribution with mean 2. A plant inspector, however, records the number of flies on a leaf only if at least 1 fly is present. What is the probability that he records 1 or 2 flies on a randomly chosen leaf? What is the expected number of flies recorded per leaf?
11. An item is produced in large numbers. The machine is known to produce 5% defectives. A quality control inspector is examining the items by taking them at random. What is the probability that at least 4 items are to be examined in order to get 2 defectives?
12. Suppose that during practice, a basketball player can make a free throw 80% of the time. Furthermore, assume that a sequence of free-throw shooting can be thought of as independent Bernoulli trials. Let X = the minimum number of free throws that this player must attempt to make a total of ten shots.
    (a) What is the pmf of X?
    (b) What is the expected value and variance of X?
    (c) What is the probability that the player must attempt 12 shots in order to make ten?