



# Practice Set – III

Sub: Statistical Methods & Data Analysis (MA 231)

1. A coffee connoisseur claims that he can distinguish between a cup of instant coffee and a cup of percolator coffee 75% of the time. It is agreed that his claim will be accepted if he correctly identifies at least 5 of the 6 cups. Find his chances of having the claim i) accepted, ii) rejected, when he does have the ability he claims.
2. The probability of failure in chemistry practical examination is 20%. If 25 batches, each comprising 6 students take the examination, in how many batches 4 or more students would pass?
3. A multiple-choice test consists of 8 questions with 3 answers to each question (of which only one is correct). A student answers each question by rolling a balanced die and checking the first answer if he gets 1 or 2, the second answer if he gets 3 or 4 and the third answer if he gets 5 or 6. To get a distinction, the student must secure at least 75% correct answers. If there is no negative marking, what is the probability that the student secures a distinction?
4. In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or better of completely destroying the target?
5. A mathematician always carries two match-boxes, each containing  $n$  matches. Whenever he needs, he chooses a box at random and draws a match from it. Find the probability that when the first box is found to be empty for the first time, the second box will contain exactly  $i$  matches.
6. Assume that each of your calls to a popular radio station has a probability of 0.03 of connecting, i.e., of not obtaining a busy signal. Assume that your calls are independent.
  - i. What is the probability that your first call that connects is your tenth call?
  - ii. What is the probability that it requires more than five calls for you to connect?
  - iii. What is the mean number of calls needed to connect?
7. In a National Basketball Association (NBA) championship series, the team who wins four games out of seven will be the winner. Suppose that team A has probability 0.55 of winning over team B and both teams A and B face each other in the championship games.
  - i. What is the probability that team A will win the series in six games?
  - ii. What is the probability that team A will win the series?
  - iii. If both teams face each other in a regional playoff series and the winner is decided by winning three out of five games, what is the probability that team A will win a playoff?
8. A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which i) neither car is used, and ii) the proportion of days on which some demand is refused.
9. In a certain factory turning out razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packet of 10. Calculate the approx. number of packets containing no defective, at most one defective and two defective blades, respectively in a consignment of 10,000 packets.

10. An insurance company found that only 0.01% of the population is involved in a certain type of accident each year. If its 1000 policy holders were randomly selected from the population, what is the probability that not more than two of its clients are involved in such an accident next year?
11. A company rents out computer time for periods of  $t$  hours for which it receives Rs. 600 per hour. The number of times the computer breaks down during  $t$  hours is a random variable having the Poisson distribution with mean  $0.8t$ . If the computer breaks down  $x$  times during  $t$  hours, it costs  $50x^2$  rupees to fix it. How should the company select  $t$  in order to maximize its expected profit?
12. A Production Process produces thousands of parts per day. On the average, 1% of the parts are defective and this average does not vary with time. Every hour a random sample of 100 parts is selected and several characteristics are observed and measured on each part; however the inspector classifies the part as either good or defective. Suppose that the inspector has instruction to stop the process if the sample has more than two defectives. Find the probability of the inspector stopping the process if we consider the sampling as  $n=100$  Bernoulli trials with  $p=0.01$ . Also find the mean number of defectives that would be found and the variance.

