

INDIAN STATISTICAL INSTITUTE

Assignment Set I

M. Tech (CS) - I Year, 2013-2014 (Semester - I)

Probability and Stochastic Processes

Deadline for submission: 07.08.2013

Total Marks : 70

Note: Answer all the problems legibly on fullscale paper. Clearly mark out your name, course, semester and roll number.

The assignments are given to aid your understanding of the subject. So, it is desired that you solve them yourself. In case you have taken any help, acknowledge it properly. Any instance of malpractice would be dealt with appropriately.

- (Q1) A total of 1232 students have taken a course in Spanish, 879 have taken a course in French, and 114 have taken a course in Russian. Further, 103 have taken courses in both Spanish and French, 23 have taken courses in both Spanish and Russian, and 14 have taken courses in both French and Russian. If 2092 students have taken at least one of Spanish, French, and Russian, how many students have taken a course in all three languages? [5]
- (Q2) Suppose that there are 1807 freshmen at your school. Of these, 453 are taking a course in computer science, 567 are taking a course in mathematics, and 299 are taking courses in both computer science and mathematics. How many are not taking a course either in computer science or in mathematics? [5]
- (Q3) Find the number of positive integers not exceeding 100 that are not divisible by 5 or by 7. [5]
- (Q4) A new employee checks the hats of n people at a restaurant, forgetting to put claim check numbers on the hats. When customers return for their hats, the checker gives them back hats chosen at random from the remaining hats. What is the probability that no one receives the correct hat? [2]
- (Q5) How many different combinations of 5, 10, 100, 500, and 1000 rupees notes can a wallet contain if it has 20 notes in it? [5]
- (Q6) How many strings of six letters are there? [2]
- (Q7) How many strings of 10 ternary digits (0, 1, or 2) are there that contain exactly two 0s, three 1s, and five 2s? [3]

- (Q8) How many solutions are there to the inequality $x_1 + x_2 + x_3 \leq 11$, where x_1, x_2 , and x_3 are nonnegative integers? [5]
- (Q9) How many ways are there to put five temporary employees into four identical offices so that atleast one employee is there in each office? [3]
- (Q10) How many different terms are there in the expansion of $(x_1 + x_2 + \cdots + x_m)^n$ after all terms with identical sets of exponents are added? [5]
- (Q11) How many ways are there to pack nine identical DVDs into three indistinguishable boxes so that each box contains at least two DVDs? [5]
- (Q12) An experiment consists of rolling a fair die 4 times in succession and recording the face value of each trial. How many outcomes are there for this experiment? [2]
- (Q13) An experiment consists of rolling a fair die and then tossing a fair coin, recording each of the results in turn. How many outcomes are there for this experiment? [2]
- (Q14) What is the probability of these events when we randomly select a permutation of the 26 lowercase letters of the English alphabet?
- (a) The permutation consists of the letters in reverse alphabetic order.
 - (b) z is the first letter of the permutation.
 - (c) z precedes a in the permutation.
 - (d) a immediately precedes z in the permutation.
 - (e) a immediately precedes m , which immediately precedes z in the permutation.
 - (f) m , n , and o are in their original places in the permutation.
- [2 × 6 = 12]
- (Q15) An urn contains s balls, numbered 1 through s. An experiment consists of selecting n successive balls from the urn with replacement. Let A be the event that no ball is selected more than once. What is $P(A)$? [5]
- (Q16) 10 balls are randomly distributed into 4 bins, numbered 1 through 4. What is the probability that bin 1 is empty? [4]