

Probability -Assignment #2

Engineering Mathematics for Advanced Studies
IIT Dharwad
Autumn 2019

Submission - Wednesday 27th Nov. 2019 5:00 pm

Total score - 10 marks

Late penalty - 1 day late* 30%, 100% for more than a day (*starts from 5:00 pm, 27th Nov. 2019!)

Assignment issue date - 20th Nov. 2019

1. How many different letter arrangements are possible using the characters in word “MATHEMATICS” (Marks 1)
2. If there are 8 residence units to be allotted to 5 employees, how many possibilities are there? (Marks 1)
3. Traffic department of government has installed radar traps at 4 different locations on a straight road. Those units are however are randomly switched ON. It is found that four units are kept 40%, 30%, 20% and 30% time ON. If a person is passing through this road with her possibility of overspeeding at those 4 locations being 0.2, 0.1, 0.5, 0.2. What is the possibility that she will be caught speeding? (Marks 2)
4. Show that Bayes formula is weighted average of the two conditional probabilities. (Marks 2)
5. In how many different ways the budget of 15 crores in an institute can be split across 7 department if the minimum amount to be given to each department has to be 1 crore and budget can be only allotted in multiple of crore? (Marks 2)
6. A lab test has 95% accuracy in detecting a disease in a person with infection. However, it also has a false positive detection rate of 1% in the healthy people. i.e. it show positive result for 1 in 100 test cases which are actually not having any infection. 0.50% of the population are know to have the infection. What is the probability a person has the disease in reality given that lab test turns out to be positive for her?
(Hint: Take even D that the person has the disease and event E that the lab test is positive. We need to find
$$P(D|E) = P(DE)/P(E)$$
Use conditional probability to re-express the numerator and the Bayes formula to expand the denominator to introduce the event D related information from the the problem) (Marks 2)