

Doctorate Entry Examination (D-LMD – 2015/2016)

12/10/2015

Major: *Telecommunications and Computer Engineering*

Topic : Probability and Advanced Mathematics	Version: C	Time Duration: 1h:30min
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Exercise 1: (05 points)

A production of a component is scheduled on a daily basis and one of two independent machines M_1 and M_2 is chosen for production. The probability that M_1 will be chosen is 0.6, and the probability that M_2 will be chosen is 0.4. Machines M_1 and M_2 produce 2% and 5% defective components, respectively. From one day production, a component chosen at random is found to be defective, find the probability that it was produced by M_1 .

Exercise 2: (05 points)

Let X represent the outcome when a die is tossed. Find the expectation of the random variable Y , where $Y=2X^2 -5$.

Exercise 3: (05 points)

Analyze in terms of a , b and c the number of possible solutions of the system and give a solution if one exists

$$\begin{cases} x + 2y - 3z = a \\ 2x + 6y - 11z = b \\ x - 2y + 7z = c \end{cases}$$

Exercise 4: (05 points)

Let the $n \times n$ matrix A satisfy $A^2 = A$ and $A^T = A$ where A^T is the transpose of A .

1. What can we say about the matrix A ?
2. What are the eigenvalues of A ? What can we say about the invertibility of A ?