**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG513 Probabilistic Models**

**HOMEWORK 5 Spring 2017-18**

1. Consider Example 3.12 which refers to a miner trapped in a mine. Let *N* denote the total number of doors selected before the miner reaches safety. Also, let *Ti*denote the travel time corresponding to the *i*th choice. Again let *X* denote the time when the miner reaches safety.
2. Give an identity that relates *X* to *N* and *Ti*.
3. What is *E[N]*?
4. What is *E[TN]*?
5. What is ?
6. Using the preceding, what is *E[X]*?
7. A manuscript is sent to a typing frim consisting of typists A, B and C. If it is typed by A, B and C then the numbers of errors made are Poisson random variables with means 3, 2.6 and 3.4, respectively. Assume that each typist is equally likely to do the work. Find *E[X]* and *Var(X)*.
8. A prisoner is trapped in a cell containing four doors. The first door leads to a tunnel that returns him to his cell after two days of travel. The second leads to a tunnel that returns him to his cell after three days of travel. The third door leads immediately to freedom. The last door leads to a tunnel that returns him to his cell after one day of travel.
9. Assuming that the prisoner will always select doors 1, 2, 3, and 4 with probability 0.4, 0.1, 0.3, 0.2 what is the expected number of days until he reaches freedom?
10. Assuming that the prisoner is always equally likely to choose among those doors that he not used, what is the expected number of days until he reaches freedom? (In this version, for instance, if the prisoner initially tries door1, then when he returns to the cell, he will now select only from doors 2, 3 and 4)
11. The number of customers entering a store on a given day is Poisson distributed with mean *λ* = 10. The amount of money spent by a customer is uniformly distributed over *(*0*,* 100*)*. Find the mean and variance of the amount of money that the store takes in on a given day.
12. *A,B*, and *C* are evenly matched tennis players. Initially *A* and *B* play a set, and the winner then plays *C*. This continues, with the winner always playing the waiting player, until one of the players has won two sets in a row. That player is then declared the overall winner. Find the probability that *A* is the overall winner.
13. *A* and *B* roll a pair of dice in turn, with *A* rolling first. *A*’s objective is to obtain a sum of 6, and *B*’s is to obtain a sum of 7. The game ends when either player reaches his or her objective, and that player is declared the winner.

(a) Find the probability that *A* is the winner.

(b) Find the expected number of rolls of the dice.

(c) Find the variance of the number of rolls of the dice.

1. Data indicate that the number of traffic accidents in Berkeley on a rainy day is a Poisson random variable with mean 15, whereas on a dry day it is a Poisson random variable with mean 5*.* Let *X* denotes the number of traffic accidents tomorrow. If it will rain tomorrow with probability 0*.*4, find (a) *E*[*X*]; (b) *P*{*X* = 0}; (c) Var*(X)*.
2. Suppose that *X* and *Y* are independent continuous random variables with exponentially (with parameter *λ*) and gamma (with parameters *2* and *λ*) respectively. Compute *P{X<Y}*.