**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG513 Probabilistic Models**

**HOMEWORK 4 Spring 2017-18**

1. Let *X1, X2, … , X10* be independent Poisson random variables with mean 4.
2. Use the Markov inequality to get a bound on.
3. Use the central limit theorem to approximate.
4. Show that



*(Hint: Let Xn be Poisson with mean n. Use the central limit theorem to show .)*

1. The time between events in a certain random experiment is iid exponential random variables with mean *m* seconds.Find the probability that the 1000th event occurs in the time interval *(100050)m*

*(Hint: Let Xj be the time between events and let Sj be the time of the nth event and use Central Limited Theorem.)373*

1. The lifetime of a special type of battery is a random variable with mean 50 hours and standard deviation 25 hours. A battery is used until it fails, at which point it is replaced by a new one. Assuming a stockpile of 30 such batteries, the lifetimes of which are independent, approximate the probability that over 1500 hours of use can be obtained.
2. Let *X* is the number of times that a fair coin, flipped 40 times, lands heads. Find the probability that *X* = 20. Use the normal approximation and then compare it to the exact solution.
3. Consider an experiment which results in one of three possible outcomes with outcome *i* occurring with probability *p1=0.5, p2=0.3, p3=0.2*. Suppose that *20* independent replications of this experiment are performed and let *Xi, i=1,2,3* denote the number of times outcome *i* appears. Determine the conditional expectation of *X1* given that *X2=8*.
4. The joint probability mass function of *X* and *Y, p(x,y),* is given by



Compute *E[X|Y=i]* for *i=1,2,3*.

1. Use the Central Limit Theorem and show that If *X* is a binomial distributed with parameters *n* and *p,* *P{X=k}* can approximated by *2ɸ(a)-1*, where *ɸ(a)* is the probability that a standard normal *Z* is less than *a*.
2. The joint density of *X* and *Y* is  show that *E[X|Y=y]=0*.
3. Let *X* be exponential with mean Find *E[X|X>1]*.
4. The joint density function of X and Y is given, compute *E[X2|Y=y]* and *E[e-x|Y=1]*.