**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG513 Probabilistic Models**

**HOMEWORK 2 Spring 2017-18**

1. If the distribution function of *F* is given by



Calculate the probability mass function of *X*. Compute *P(1.85<x<3.45)*.

1. Suppose that *X* has a binomial distribution with parameters 6 and 0.5 show that *X* = 3 is the most likely outcome.
2. Suppose that an experiment can result in one of *r* possible outcomes, the *i*th outcome having probability *pi, i=1,...,r,*. If *n* of these experiments are performed, and if the outcome of any one of the *n* does not affect the outcome of the other *n-1* experiments, then show that the probability that the first outcome appears *x1* times, the second *x2* times, and the *r*th *xr* times is

 when *x1+x2+...+xr=n*

This is known as the *multinomial* distribution.

1. Find expected value and variance of *Y=(3X-1)2* where *X=N(3,2)*.
2. A player at a fair pays $1.50 to toss a coin three times. The player receives $1 if the number of

heads is 2, $8 if the number is 3, but nothing otherwise. Find the expected value of the reward *Y*. What is the expected value of the gain?

1. A television store owner figure that 50 present of the customers entering his store will purchase an ordinary television set 20 present will purchase a colour television set and 30 present will just be browsing. If five customers enter his store on a certain day, what is the probability that two customers purchase colour sets, one customer purchases an ordinary set, two customers purchase nothing?
2. If you buy a lottery ticket in 50 lotteries, in each of which your chance of winning a prize is 0.02, what is the (approximate) probability that you will win a prize (a) at least once, (b) exactly once, (c) at least twice?
3. Suppose that a cylinder of a car engine will fail, while working, with probability *1-p* independently from cylinder to cylinder. Suppose that an engine will make a successful performance if at least 50 percent of its cylinder remains operative. For what value of *p* is a six-cylinder engine preferable to four-cylinder engine?
4. Let *X* be a random variable with probability density



1. What is the value of *c*?
2. What is the cumulative distribution function of *X*?
3. Compute *P{-0.3≤x≤0.7}.*
4. A production line yields two types of devices.Type 1 devices occur with probability *a* and work for a relatively short time that is geometrically distributed with parameter *r*.Type 2 devices work much longer, occur with probability *1-a* and have a lifetime that is geometrically distributed with parameter *s*. Let *X* be the lifetime of an arbitrary device. Find the pmf of *X*. Find mean and variance.
5. Assume that the following function *f(x,y)* is the joint distribution density function for *X* and *Y*



1. Find *c*.
2. Find *fY(y)*.
3. Are *X* and *Y* independent?
4. Find .
5. Suppose that the service time of customers at a bank *X* is an exponential random variable with parameter *λ=0.1*. The person ahead of you has been served for 10 minutes, what is the probability that you will wait another 10 minutes or more before getting served?