Probability Theory

Assignment-1 Max Marks: 100

Due date:12/11/18

1. If the discrete random variable X denotes the minimum of the two numbers that appear when a pair of fair dice is thrown once.
   (a)Find the probability mass function (Also sketch the graph)
   (b)Find Cumulative distribution function (Also sketch the graph)
   (c)Find expectation, variance, standard deviation and skewness.
2. A random variable X has the following PMF

x	0	1	2	3	4	5	6	7
P(X=x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

   (a)Find k

   (b)Evaluate P(X<6),P(X≥6),P(0<X<5)

   (c) If P(X≤a)>0.5.Find the minimum value of a

3. A player tosses 3 fair coins. He wins Rs.500 if 3 heads occur, Rs.300 if 2 heads occur, Rs.100 if one head occurs. On the other hand he loses Rs.1500 if 3 tails occur. Find the value of the game to the player. Is game favorable to the player?
4. If CDF of random variable X is given by $F_X(x)$=

0	x<0
1/2	0≤x<1
3/5	1≤x<2
4/5	2≤x<3
9/10	3≤x<3.5
1	x≥3.5

   Find the probability mass function of X.

5. If E[X]=10,Var[X]=1 and Y=2X(X+20) find E[Y]
   (b)If E[X]=1,$E[X^2]$=4 and Y= 2X-3.Find the second central moment of Y about c=3.
6. If a ticket drawn from a box containing 10 tickets numbered 1 to 10 inclusive.
   (a)Discuss about its probability distribution
   (b)Find the probability that the number x drawn is
   (i)even number (ii) prime number (iii) less than 4
   (c)Find the mean and variance of the random variable X
7. The probability that a student is accepted in a prestigious college is 0.3.If five students from same school apply.
   (a) Discuss about its probability distribution

(b) What is the probability that at most two students are accepted
(c) Find mean and variance of the random variable

8. Suppose that on average one person in 1000 makes a numerical error in preparing income tax return. If 10000 forms are selected at random and examined.
   (a) Discuss about its probability distribution
   (b) Find the probability that 6,7 or 8 of the forms will be in error.
   (c) Find the mean and the variance of the random variable.
9. A man hits the target with probability 0.25.how many times would he fail on average before he hits the target.[Hint: Let X be the random variable the represents the number of failures before first success].Give the PMF and E[X]
10. The probability to find the defective item is 0.35 in an inspection. what is the probability that the inspector picks 25 items before he finds 8 defective pieces.
    (a) Discuss about its probability distribution
    (b) Find mean and variance