**Assignment 4, PME, 4th Semester, Spring 2023**

*Deadline*: Before the final exam paper of PME

*Assignment should be hand written.*

*Write your name, registration No. and section; else your assignment may not be marked.*

*Copying is not allowed.*

*Properly staple your pages (binding is not required).*

1. Let *X* be the number of heads obtained when a fair coin is flipped four times.
   1. Describe the underlying space *S* of this random experiment and specify the probabilities of its elementary events.
   2. Show the mapping from *S* to *SX*, the range of *X*.
   3. Find the probabilities for the various values of *X*.
2. An urn contains nine Rs. 10 notes and one Rs. 50 note. Let the random variable *X* be the total amount that results when two notes are drawn from the urn without replacement.
   1. Describe the underlying space *S* of this random experiment and specify the probabilities of its elementary events.
   2. Show the mapping from *S* to *SX*, the range of *X*.
   3. Find the probabilities for the various values of *X*.
3. Let *X* be a random variable with pmf *pk =* 0.6*/k*2 for *k* = 1, 2, 3, ... .
   1. Find *P*[*X* > 4].
   2. Find *P*[6 ≤ *X* ≤ 8].
4. Show that the *VAR*[*X*] of a binomial random variable *X* is *npq*.
5. Find 1st moment, 2nd moment and variance of *X* in question 1 and 2.
6. *SC* = {1, 2, 3, 4} where *C* is a uniform random variable having four possible values of electric current. If *W* is a random variable and represents the corresponding power values such that *W* = 3*C*2. Find the mean and variance of *C* and *W*. Also find *E*[*C*3].
7. The number *N* of customers arriving in *t* seconds at a restaurant is a Poisson random variable with *α* = *λt* where *λ* is the average arrival rate in customers/second. Assume that the arrival rate is 6 customers per hour. Find the probability of the following events:
   1. more than 18 customers in 2 hours
   2. less than or equal to 12 customers in 2 hours.
8. Show that the probability generating function of a geometrically distributed random variable *X* with pmf is .
9. Find the mean of RV *X* if is .
10. Find the variance of RV *X* if is and is .
11. Find the mean of a geometric RV using generating function.
12. Let *X* be the number of heads obtained when a fair coin is flipped four times.
    1. Plot the cdf of *X*.
    2. Use properties of cdf to find *P*[2 < *X* ≤ 3], *P*[0.7 ≤ *X* ≤ 1.3] and *P*[1 ≤ *X* < 3].