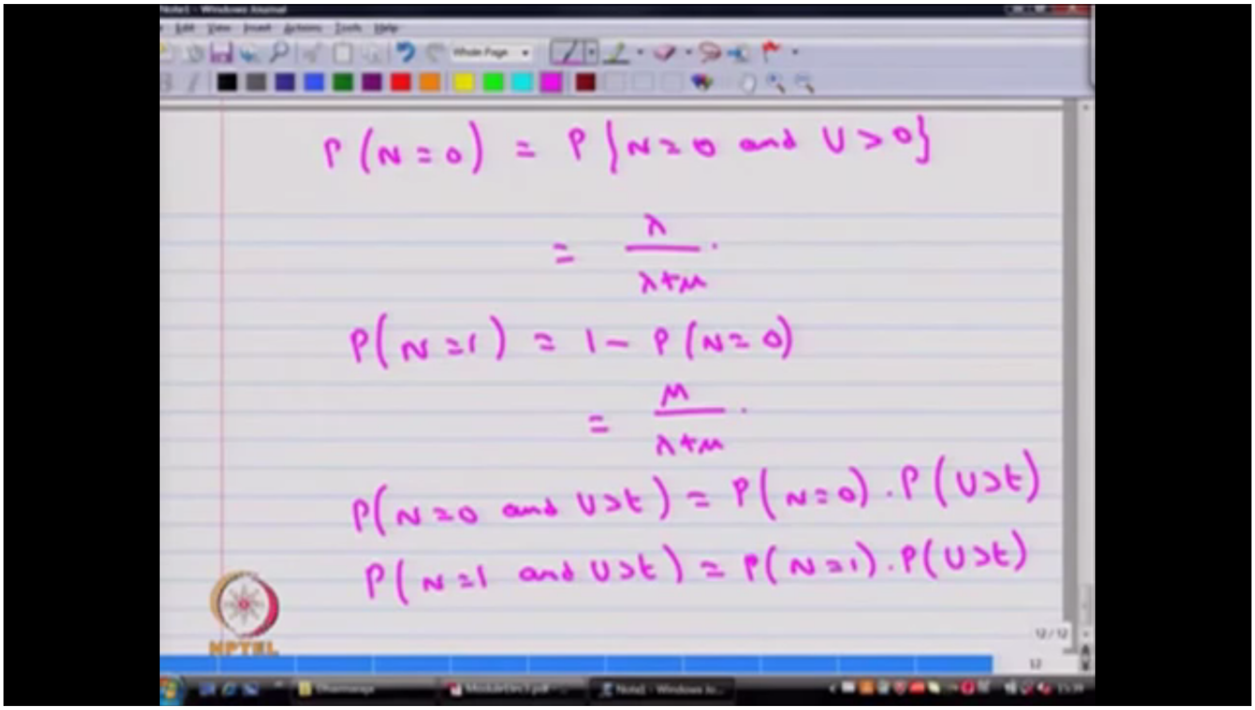
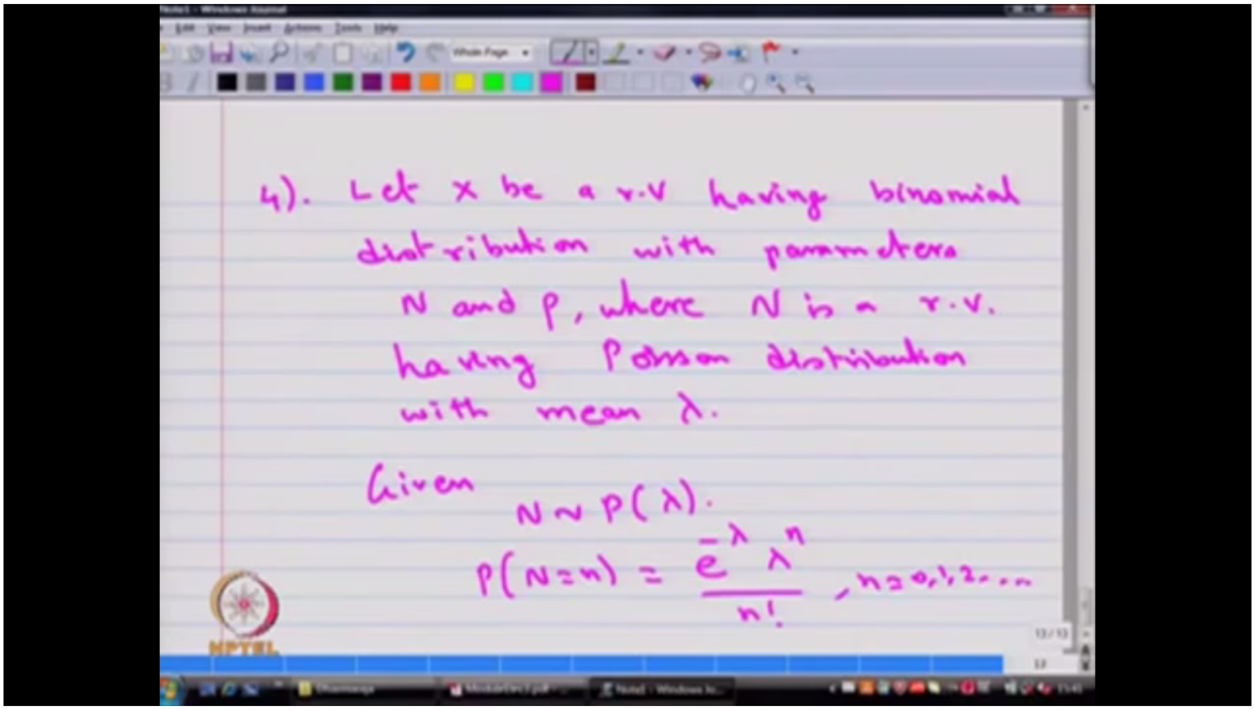
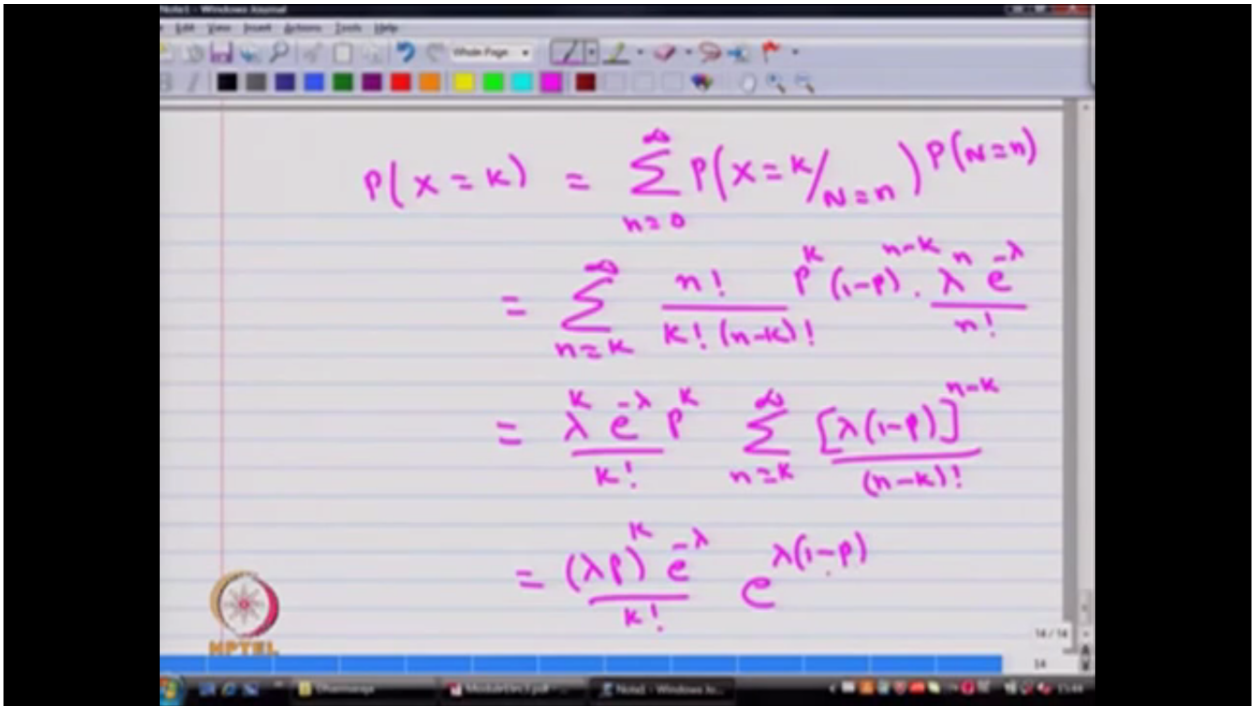


So in this example we observe that N and U are independent random variables and also by seeing a probability of U greater than T that is e power minus lambda plus mu T you can conclude U is a exponential distribution with the parameter lambda plus mu.

Now we move into the next example. Let X be a random variable having binomial distribution with parameters N and P where N is a random variable having Poisson distribution with mean lambda. The question is find the marginal distribution of X or find the probability mass function of the random variable X. Given N is Poisson distribution with the parameter lambda that means the probability mass function for the random variable N is e power minus lambda lambda power n divided by n factorial. The possible values of N are 0, 1, 2, and so on. Our interest is to find out what is a probability mass function of the random variable X.



That is same as n is equal to 0 to infinity what is the conditional probability of the variable X takes the value K given the other random variable N takes a value n multiplied by probability of N takes a value n. That is same as the n takes the value from K to infinity n factorial divided by K factorial into n minus K factorial and P power K 1 minus P power n minus K multiplied by lambda power n e power minus lambda divided by n factorial. So no need of n is equal to 0 to K minus 1 because the capital N takes a value n therefore the running index from K to infinity. That is same as you can take some terms outside that is lambda power K e power minus lambda P power K divided by K factorial.



The remaining terms that is N is running from K to infinity this can be written in the form of lambda times 1 minus P power n minus K divided by n minus K factorial. That is same as lambda P power K multiplied by e power minus lambda by K factorial.

The summation N is equal to K to infinity and so on that becomes e power lambda times 1 minus P. Therefore, further you can simplify. Therefore, the probability of X takes the value K is same as lambda P power K e power minus lambda lambda P divided by K factorial where K takes a value 0, 1, 2, and so on.

Hence, the conclusion is the random variable X which is Poisson distributed with the parameter lambda times. So this problem occurs in many situations of stochastic modeling. Therefore we have discussed this example in this lecture.