

**For Part - 1 :**

Code - ques\_2a.m

I create two matrices poiss\_x and poiss\_y to store the numbers generated by the poissrnd(.) function with lambda = 3 and 4 respectively

Then I created P\_z\_estimate to store the values of poisson distribution function for the z values from 0 to 25 by the putting the condition to add 1 to a particular value of z if  $x + y = z$

Then I created the P-z to store the actual values of poisson distribution function using

New lambda = lambda\_x + lambda\_y

If  $Z = X + Y$  then theoretically  $P(Z) = P_{\text{poisson}}(Z; \lambda_x + \lambda_y)$

<b><u>Value of k</u></b>	<b><u>P calculated from data</u></b>	<b><u>P calculated from function</u></b>
0	0.000924	0.000912
1	0.0064	0.0064
2	0.0224	0.0223
3	0.0524	0.0521
4	0.0913	0.0912
5	0.1274	0.1277
6	0.1488	0.1490
7	0.1489	0.1490
8	0.1304	0.1304
9	0.1013	0.1014
10	0.0710	0.0710
11	0.0451	0.0452
12	0.0264	0.0263
13	0.0143	0.0142
14	0.0072	0.0071
15	0.0033	0.0033
16	0.0015	0.0014
17	0.000586	0.000596
18	0.000232	0.000232
19	9.400e-05	8.545e-05
20	1.400e-05	2.991e-05
21	8.000e-06	9.969e-06
22	6.000e-06	3.172e-06
23	0	9.654e-07
24	0	2.816e-07
25	0	7.884e-08

**For Part - 2 :**

Code - ques\_2b.m

In poiss\_y , I stored the random poisson values with lambda = 4

And in P\_z , I calculated the value for poisson distribution for k = 0 to 25

The function prob takes three values n,k,p and calculates the probability of k success in n trials with a winning probability of p using binornd(.) function

And then to calculate the value after poisson thinning I used the formula given in the slides

$P(Y=k) = \sum P(y=k | X=j) P(X=j)$  for j = k to infinity

In P\_bin\_z , I store the values after Poisson thinning calculated from random data

In P\_Actual , I store the values after Poisson thinning calculated from actual function

Theoretically if we have to implement poisson thinning with success probability p then new lambda becomes p times the original lambda as given below

$$P(Y) = P_{\text{poisson}}(Y ; \lambda p)$$

<b><u>Value of k</u></b>	<b><u>P calculated from data</u></b>	<b><u>P calculated from function</u></b>
0	0.0588	0.0408
1	0.1450	0.1304
2	0.2118	0.2087
3	0.2152	0.2226
4	0.1652	0.1781
5	0.1036	0.1140
6	0.0547	0.0608
7	0.0247	0.0278
8	0.0099	0.0111
9	0.0036	0.0040
10	0.0011	0.0013
11	3.274e-04	3.679e-04
12	8.243e-05	9.811e-05
13	1.817e-05	2.415e-05
14	4.848e-06	5.520e-06
15	1.232e-06	1.178e-06
16	2.246e-07	2.355e-07
17	0	4.433e-08
18	0	7.882e-09
19	0	1.327e-09
20	0	2.124e-10
21	0	3.236e-11
22	0	4.708e-12
23	0	6.549e-13
24	0	8.733e-14
25	0	1.118e-14