   A large population of ALOHA users manages to generate 50 requests/sec, including both originals and retransmissions. Time is slotted in units of 40 msec.

(a) What is the chance of success on the first attempt?

(b) What is the probability of exactly k collisions and then a success?

(c) What is the expected number of transmission attempts needed?

Step 1: Given information

Here to find G we have to find number of frames that are generated in 1 slot time which is given as 40 ms.

Given data

In 1000 ms number of frames generated   =   50

      So, number of frames generated in 40 ms       =  (50 / 1000) \* 40

                                                                   =   2

      Hence the value of G                 =   2

Now we solve the given parts one by one.

Step 2: Explanation of

What is the chance of success on the first attempt?

P(success at first attempt)         =      P(0)

                                                =      e-G

***=      e-2***

Step 3: Explanation for

What is the probability of exactly k collisions and then a success

P(success after k collisions)      =    [ P(failure) ]k  P(success)

                                               =   (1 - e-G)k e-G

=  ***(1 - e-2)k e-2***

***Step 4: Explanation for***

What is the expected number of transmission attempts needed?

Expected Number of attempts    =   1 . P(1)  + 2 . P(2) ............... infinite terms

                                               =    Σ k . P(k)  [ Where P(k) is the probability of success at kth attempt ]

=    Σ k . e-G (1 - e-G)k-1

This is an infinite arithmetic geometric progression.So finding this sum , we get :

Number of attempts(expected or mean number)    =   eG

                                                                        =   e2

                                                                        =   7.39

***= 8 [As number of attempts should be an integer]***