1. Light Speed: 300000 km/sec => Ans: (come and back, request and response)4 * 40000/300000 $\approx$ 0.533sec

2. The mean of hopping is $2\sum_{i=0}^{n-1} i\frac{2^i}{2^n-1} = \frac{2}{2^n-1}\sum_{i=0}^{n-1} i2^i$

   Let S = $\sum_{i=0}^{n-1} i2^i$

   $2S = \sum_{i=0}^{n-1} i2^{i+1}$

   $S = 2S - S = \sum_{i=0}^{n-1} i2^{i+1} - \sum_{i=0}^{n-1} i2^i = n2^n + \sum_{i=2}^{n-1}(-2^i) - 2 = n2^n - (\frac{2^n-2^2}{2-1}) - 2 = (n-2)2^n + 2$

   $\frac{2}{2^n-1}\sum_{i=0}^{n-1} i2^i = \frac{2*2^n}{2^n-1}(n-2+\frac{1}{2^{n-1}})$

   $lim_{n\to\infty}\frac{2*2^n}{2^n-1}(n-2+\frac{1}{2^{n-1}}) = 2*(n-2) = 2n-4$

3. $Ans = 1-$ (No one use Channel) - (Only one use channel) = $1 - (1-p)^n - np(1-p)^{n-1}$

4. Connectionless communication means it doesn't promise the succeed of data of reach the end point, so it often use in the service you want it faster(e.g. UDP),

   Connection-oriented communication means it promise the succeed of data of reach the end point, so it often use in the service you want it reliable(e.g. TCP)

5. $Ans = (1-p) + 2p(1-p) + 3p^2(1-p)...+np^{n-1}(1-p) = \sum_{n=1}^{\infty} n(1-p)p^{n-1} = \frac{1}{1-p}$

6. Image has $1024 * 768 * 3 * 8 = 2359296 * 8 = 18874368$bits

   56kbps = 56000bps=> 18874368 / 56000 $\approx$ 337.04sec

   1Mbps = 1000000bps => 18874368 / 1000000 $\approx$ 18.87sec

   100Mbps = 100000000 => 18874368 / 100000000 $\approx$ 0.19sec

7. Light speed in coax = $\frac{2}{3} * 300000 = 200000$ Km/sec

   10Mbps = 10000000bps $\rightarrow$ 1bit = $\frac{1}{10000000} = 1e^{-7}$sec = $1e^{-7} * 200000 = 0.02$km=20m

8.