

CS 408 Homework 1

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1 Question 1

- a) 1 packet \rightarrow 125 bytes \rightarrow 1000 bits
1 Mbps \rightarrow 10^6 Bps
Transmission delay = 1000 bits / 10^6 bps = 10^{-3} sec \rightarrow 1 msec
Propagation delay = 100 km / 200000 km/s = 0.5 msec
Process delay \rightarrow 2 msec
Acknowledgment delay = 0.01 sec \rightarrow 10 msec
Total time = Transmission*(15+1) + Propagation*(1+1) + Processing*1 + Acknowledgment.
 $= 1*16 + 0.5*2 + 2*1 + 10$
 $= 29$ msec
- b) Utilization = Transmission time / Total time
 $= 16/29 = 0.5517$

2 Question 2

- a) For this case to happen, the following scenario should occur:
- 1) Aragon sends the message successfully
 - 2) Sauron sends acknowledgment to Aragon successfully
 - 3) Sauron does not receive the acknowledgment that Aragon sent
- $P(\text{Only one of them going to the meeting}) = 3/4 * 3/4 * 1/4 = 9/64$
- b) For this case to happen, one of the following scenarios should occur:
- First Scenario:
- 1) Sauron does not receive the message
- Second Scenario
- 1) Sauron receives the message
 - 2) Aragon does not receive the acknowledgment that Sauron sent
- $P(\text{None of them going to the meeting}) = 1/4 + (3/4 * 1/4) = 7/16$

3 Question 3

To make the connection such that the remaining nodes are still connected to each other in case of a dysfunction of a node, every node should be linked to

at least two other nodes. 7 links are enough to connect all the nodes satisfying the condition. (I moved the two nodes in the middle to the bottom to show the links better.) Or simply the HEPTAGON is another way to show it.

