

Homework 6

Due 7 pm, March 31, 2018 (Saturday)

Total points: 40

You will be able to submit your homework in Compass only once. Before you submit the homework, be sure that you have completed all your work.

1. (10 points) Consider slide 9 in the set at <https://courses.engr.illinois.edu/ece428/sp2018/link-reversal.pdf>. Note that, in this network, node D is the destination. Show how the link reversal algorithm will change directions of the links, if link CE breaks in the network on slide 9 (i.e., link CE is removed from the network). Present your answer in the form of a sequence of network states, as shown in earlier slides in the above set of slides.

RECOMMENDED EXERCISE: What would happen if link CD breaks in the network on slide 9? Would the network state stabilize?

2. (10 points) Hypercube topology was discussed in class in the lecture on March 13. Consider a 4-dimensional hypercube (which consists of $2^4=16$ nodes). If node labeled 0000 (in binary) is removed from the network, determine the following in the resulting network.

(a) The length of the shortest path (in number of links) between nodes 1111 and 0010 (note that the node identifiers are in binary).

(b) Number of node-disjoint shortest paths between nodes 0101 and 1010. Here, two paths are node-disjoint if they do not have any nodes in common except the two endpoints (i.e., 0101 and 1010 in this question).

3. (10 points) Consider the Chord network shown on slide 10 in the set at <https://courses.engr.illinois.edu/ece428/sp2018/indy-p2p.pptx> or <https://courses.engr.illinois.edu/ece428/sp2018/indy-p2p.pdf>.

Determine the finger table at node N112. Present your answer in the format for the finger table at N80 shown in the above slide.

RECOMMENDED EXERCISE: Which node will store information for key K81? If node N112 wants to locate information for K81, in the network figure, draw the sequence of request messages that will be sent.

4. (10 points) The figure below shows interleaving of two transactions, T1 and T2. In the operations below, `a.read()` denotes a read operation on object a. `a.write(v)` denotes a write operation on object a that writes value v.

(a) In this figure, mark all the conflicts between operations of transactions T1 and T2 using arrows similar to those in slide 16 in the set of slides at <https://courses.engr.illinois.edu/ece428/sp2018/transactions-1.pptx> or <https://courses.engr.illinois.edu/ece428/sp2018/transactions-1.pdf>.

(b) Is the interleaving below serially equivalent? Answer YES or NO.

T1:	T2:
a.read()	c.read()
b.write(4)	a.write(8)
c.read()	d.read()
d.write(9)	b.write(3)
commit	commit