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CSC72010, Assignment 1: Answers

1. minimum: uids arranged in clockwise-increasing order

initiate processes	n
leader's uid goes around	$2n$
every uid other than leader goes only to the next process	$2(n-1)$
leader declares itself	1
total	$5n-1$

maximum: uids arranged in clockwise-decreasing order

initiate processes	n
leader's uid goes around	$2n$
every uid other than leader goes around to the leader (a)	$n(n-1)$
leader declares itself	1
total	n^2+2n+1

(a) This is twice the sum of the integers (1+...+n-1)

2. Reordering channel, minimum: uids arranged in clockwise-increasing order

initiate processes	n
leader's uid goes around	$2n$
every uid other than leader goes only to the next CHANNEL (b)	$n-1$
leader declares itself	1
total	$4n$

(b) because the leader's uid can jump ahead of other uids in every channel

maximum: same as in question 1.

Channels are not *required* to reorder messages. The maximum number of transitions occurs when all messages are transmitted in the sequence in which they were sent.

3. (i) "Lossy" channels - minimum transitions to successfully elect leader:

initiate processes	n
leader's uid goes around	$2n$
every uid other than leader goes only to the next CHANNEL (c)	$n-1$
leader declares itself	1
total	$4n$

(c) Uids other than the leader's are lost in the channels. If the leader's uid is also lost, there is an absolute minimum of 2n transitions (n to initiate, n to send all uids to the adjacent channel where they are lost) but no leader is elected.

(ii) "Lossy" channels - maximum is same as in question 1.

Channels are not required to lose messages.

(iii) Duplicating channels - minimum is same as in question 1.

Channels are not required to duplicate.

(iv) Duplicating channels - maximum is infinite.

Any number of "loser" uids can be duplicated and forwarded around the ring before the leader's uid finishes its circuit.