



Name: \_\_\_\_\_

3. Briefly explain (i) the hardware behind a physical clock, and (ii) how it is used to determine time-of-day. (15 points)

4. With logical and vector clocks, if  $a \rightarrow b$ , then  $C(a) < C(b)$ . Is it also true that if  $C(a) < C(b)$ , then  $a \rightarrow b$ ? Explain. (10 points)

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5. For each of the following mutual exclusion algorithms, clearly explain either (i) how it guarantees “happened before” ordering of the requests, or (ii) why it does not make this guarantee. Note that I am not asking for a summary of the algorithm, but instead an answer to this specific question! (28 points)

a. Lamport’s algorithm

b. Suzuki and Kasimi’s algorithm

c. Le Lann’s token ring algorithm

d. Raymond’s tree algorithm

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6. For each of the three types of messages sent by Garcia-Molina's bully algorithm, does the algorithm work correctly if an individual message gets lost? Explain your answer. (15 points)

7. What is the big (i) advantage and (ii) disadvantage of self-stabilizing algorithms? (7 points)