

Quiz2

CS5320: Distributed Computing

Spring 2020

Instructions: Please type your answers. Convert the document to pdf and then upload.

Q1 (5 points). Consider Lamport's Mutual Exclusion (LME) algorithm being executed in asynchronous system. Please develop a crash fault-tolerant variant of LME. You can use any consensus protocol of your choice for achieving this transformation.

Q2 (5 points). Please explain how Phase King algorithm ensures validity condition?

Q3 (8 points). Consider the alternating bit protocol (ABP). Now, please explain why are the following scenarios not possible?

(a) $(m[0], 0) \leftarrow (m[1], 1) \leftarrow (m[0], 0)$

(b) $(m[0], 0) \leftarrow (m[1], 1) \leftarrow (m[2], 0)$

Here $(m[i], 0) \leftarrow (m[j], 1)$ implies that $(m[i], 0)$ is **followed by** $(m[j], 1)$ in the channel. Note that the ABP protocols assumes that the channels are FIFO.

Q4 (8 points). In the class we studied several transformations among which are: (a) Solving Interactive Consistency using Byzantine Agreement (b) Solving Consensus using Interactive Consistency. How will these transformations behave if we don't have majority of the processes as correct w.r.t the agreement and validity properties. It is clear that these transformations satisfy termination.