

Question 2

$$s \rightarrow t \text{ iff } (s.v[s.p] \leq t.v[s.p]) \text{ and } (s.v[t.p] < t.v[t.p])$$

Part 1

$$\text{not}(s \rightarrow t) \text{ implies } \text{not}((s.v[s.p] \leq t.v[s.p]) \text{ and } (s.v[t.p] < t.v[t.p]))$$

$$\hookrightarrow (s.v[s.p] > t.v[s.p]) \text{ or } (s.v[t.p] \geq t.v[t.p])$$

Case 1: $s.p = t.p$ (if they belong to same process)

s occurs after $t \rightarrow s.v[s.p] > t.v[s.p]$ correct

Case 2: $s.p \neq t.p$ (if they are events from different processes)

t cannot occur after s , either t didn't update itself after s is progressed $\rightarrow s.v[s.p] > t.v[s.p]$

or s is updated itself after t sent message

$s.v[t.p] > t.v[t.p]$ seems not possible, $s.v[t.p] = t.v[t.p]$ is possible though, hence $s.v[t.p] > t.v[t.p]$ is correct.

Part 2

$$s \rightarrow t \text{ implies } (s.v[s.p] \leq t.v[s.p]) \text{ and } (s.v[t.p] < t.v[t.p])$$

t definitely comes after s and there is a causality. Time of s at t must be equal to time of s at s vector or greater.

$$\hookrightarrow s.v[s.p] \leq t.v[s.p] \text{ is correct.}$$

Since t comes after, there is a message passed from s , so time of t must be incremented so time of t is strictly greater than the time at s . $\rightarrow s.v[t.p] < t.v[t.p]$

Hence the proposal is correct.