CMPS 396W - Homework 1

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1 Problem 1

In this problem we need to fix mutex to be live using Eshmun

We have two processes; each process can have 3 different states
Ni: Neutral state where process i does not require critical section
Ti: Trying state where process i request entry to the critical section
Ci: Process i is in the critical section

We added F that relate to fairness.

Using Eshmun tool we need to solve this problem by making sure that our solution satisfies the liveness property and mutual exclusion.
Liveness : This means that for all paths we have, if process 1 is trying $T1$ eventually process 1 will enter the critical section $C1$. This case also applies to process 2.

Mutual Exclusion : To satisfy this rule we need to avoid having a state where both process 1 and 2 are at the same time in the critical section.

In my solution I managed to satisfy the above two rules; Liveness and Mutual Exclusion. And the model was correct.

Example of a possible scenario:
- S0 : both process 1 and 2 are in the neutral state.
- S2 : process 1 is neutral process 2 trying.
- S4_1 : both processes are trying with fairness to process 1 after process 2 leaves critical section.
- S8 : process 1 trying process 2 in the critical section and fairness for process 1.
- S7 : process 1 trying and process 2 in critical section.
- S1 : process 1 trying and process 2 neutral.
- S4_2 : both processes are trying with fairness to process 2 after process 1 leaves critical section.
- S9 : process 1 in critical section process 2 trying fairness for process 2.
- S6 : process 1 in critical section process 2 trying.

- S2 : process 1 neutral process 2 trying.

Please find as attachment in the zip file a picture for Eshmun.

2 Problem 2

First possible case:
i- f = FFFFF....FF p if number of F's = N then the formula means eventually F..Fp with number of F's = N-1 will hold. By recursing on the F's we will get at last that p will eventually holds. so FFF...FFp = Fp.

ii- f = GGG...GGp = globally G...Gp will globally be true, if we follow the same concept as FF..Fp we can say that globally p is true. so GGG....GGp = Gp

iii- f = FGp = eventually we will reach a state where after it p will always hold Gp.

iv- f = GFp = Globally Fp is true , each Fp means that eventually p will always be true.

v- f = FGFp this means that eventually GFp will holds and Fp globally holds and p eventually holds due to the same meaning FGFp can be reduced to GFp

vi-f = GFGp so FGp globally holds and Gp eventually holds where p will globally holds. so as 'v' due to the meaning GFGp can be reduced to FGp

Now any formula can be reduced to one of the previous reductions.
Example :

FGFGFGFG...FGFp can be reduced to GFp by 'v'
GFGFG...GFGp can be reduced to FGp by 'vi'