

C340 Concurrency Tutorial3 - Answer Sheet

Exercise 1:

```
progress BLUE_CARS = {blue[ID].enter}  
progress RED_CARS = {red[ID].enter}
```

Exercise 2:

```
HEAVY_TRAFFIC = (SINGLELANEBRIDGE)>>{red[ID].exit, blue[ID].exit}
```

Exercise 3:

```
const N=3  
const True=1  
const False=0  
range B=False..True  
range T=0..N  
range ID=1..N  
CAR = (request->enter->exit->CAR).  
  
NOPASS1=C[1],  
C[i:ID]=([i].enter->C[i%N+1]).  
NOPASS2=C[1],  
C[i:ID]=([i].exit->C[i%N+1]).  
  
| | CONVOY=( [ID]:CAR | | NOPASS1 | | NOPASS2 ).  
| | CARS=(red:CONVOY | | blue:CONVOY ).  
  
BRIDGE=BRIDGE[0][0][0][0][True],  
BRIDGE[nr:T][nb:T][wr:T][wb:T][bt:B]=  
  (when(wr<N) red[ID].request->BRIDGE[nr][nb][wr+1][wb][bt]  
  |when(wb<N) blue[ID].request->BRIDGE[nr][nb][wr][wb+1][bt]  
  |when(nr<N&&wr>0&&nb==0&&(wb==0 | | !bt)) red[ID].enter->BRIDGE[nr+1][nb][wr-1][wb][bt]  
  |when(nb<N&&wb>0&&nr==0&&(wr==0 | | bt)) blue[ID].enter->BRIDGE[nr][nb+1][wr][wb-1][bt]  
  |when(nr>0) red[ID].exit -> BRIDGE[nr-1][nb][wr][wb][True]  
  |when(nb>0) blue[ID].exit-> BRIDGE[nr][nb-1][wr][wb][False]  
  ).  
  
| | SINGLELANEBRIDGE = (CARS | | BRIDGE)>>{red[ID].exit,blue[ID].exit}.  
  
progress BLUE_CARS = {blue[ID].enter}  
progress RED_CARS = {red[ID].enter}
```