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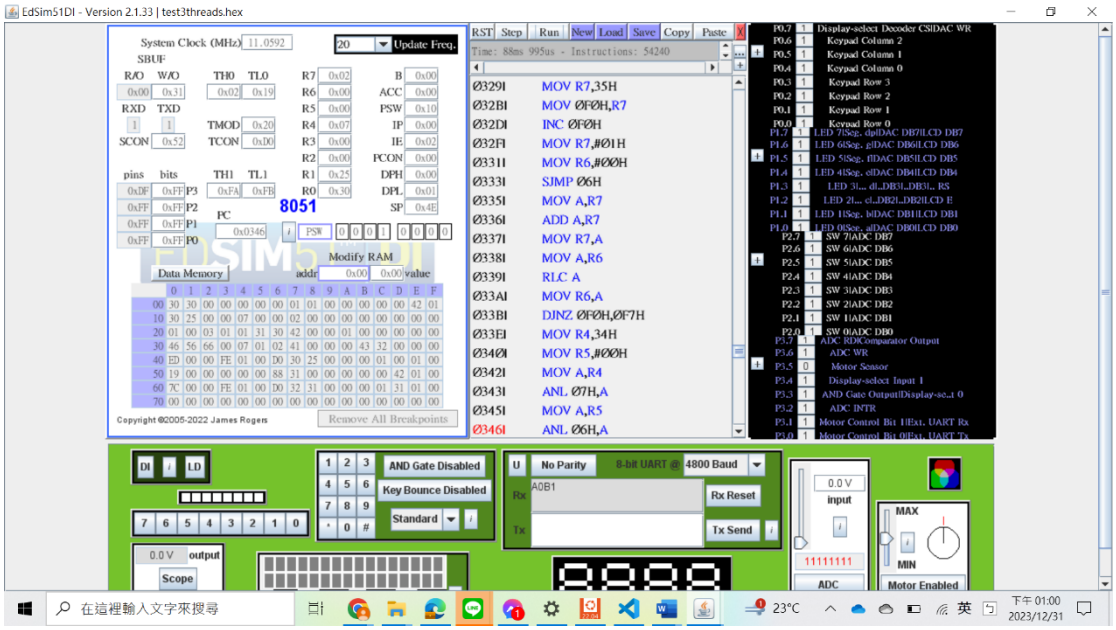
Typescript:

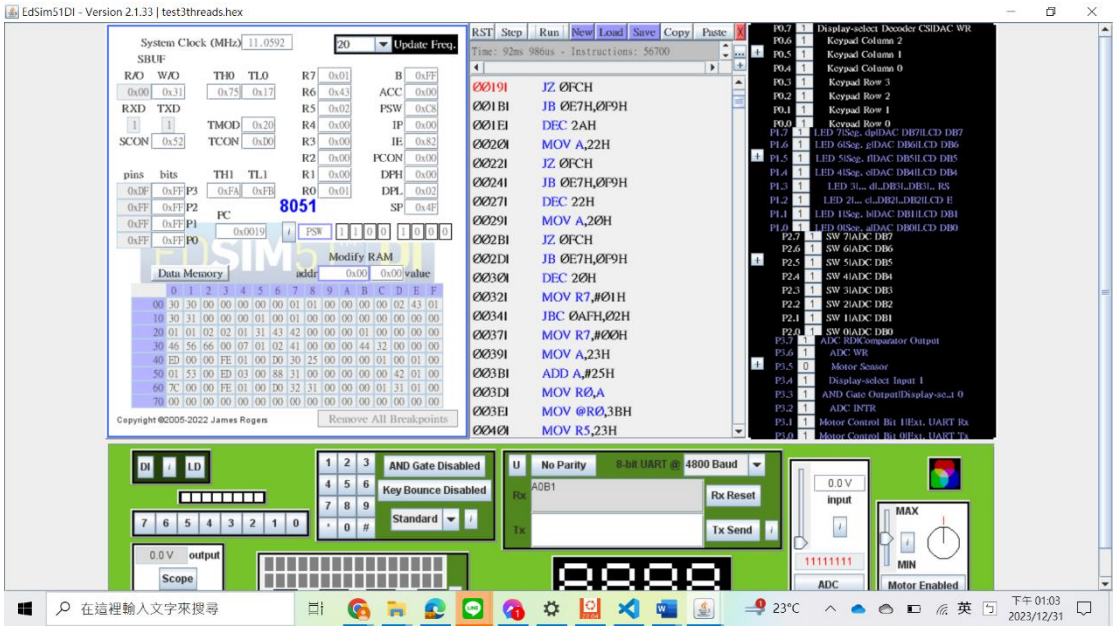
```
cathy@LAPTOP-ENINKNOR:/mnt/c/users/catherine/desktop/project/project4/110062132-ppc4$ make
sdcc -c  test3threads.c
sdcc -c  preemptive.c
preemptive.c:133: warning 85: in function ThreadCreate unreferenced function argument : 'fp'
sdcc  -o test3threads.hex test3threads.rel preemptive.rel
cathy@LAPTOP-ENINKNOR:/mnt/c/users/catherine/desktop/project/project4/110062132-ppc4$ make clean
rm *.hex *.ihx *.lnk *.lst *.map *.mem *.rel *.rst *.sym
rm: cannot remove '*.ihx': No such file or directory
rm: cannot remove '*.lnk': No such file or directory
make: *** [Makefile:25: clean] Error 1
```

Producer1 is running. The ‘cur_thread’ in 35H is 01 now. (Producer1() is thread 1)

At first, ‘empty’ in 22H is 3, and ‘mutex’ in 20H is 1, and ‘turn1’ in 2AH is 1.

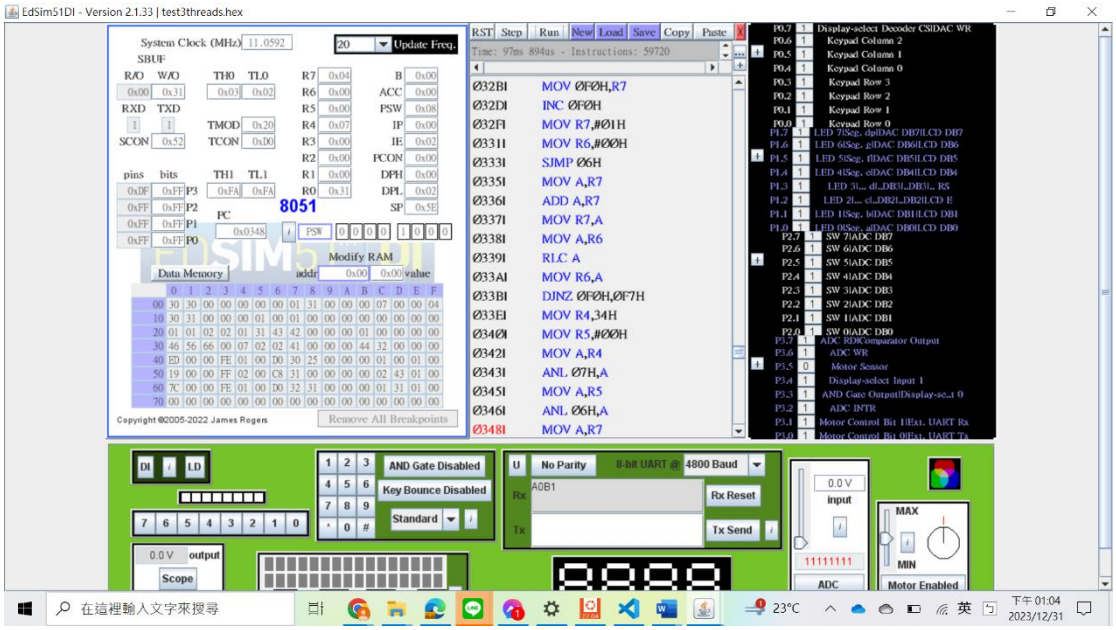


The ‘mutex’ changes to 0 and returns to 1 in the end. The ‘full’ turns to 1 in the end, and ‘empty’ turns to 2 in the end. Also, ‘turn1’ in 2AH turns to 0, and ‘turn2’ in 2BH turns to 1.

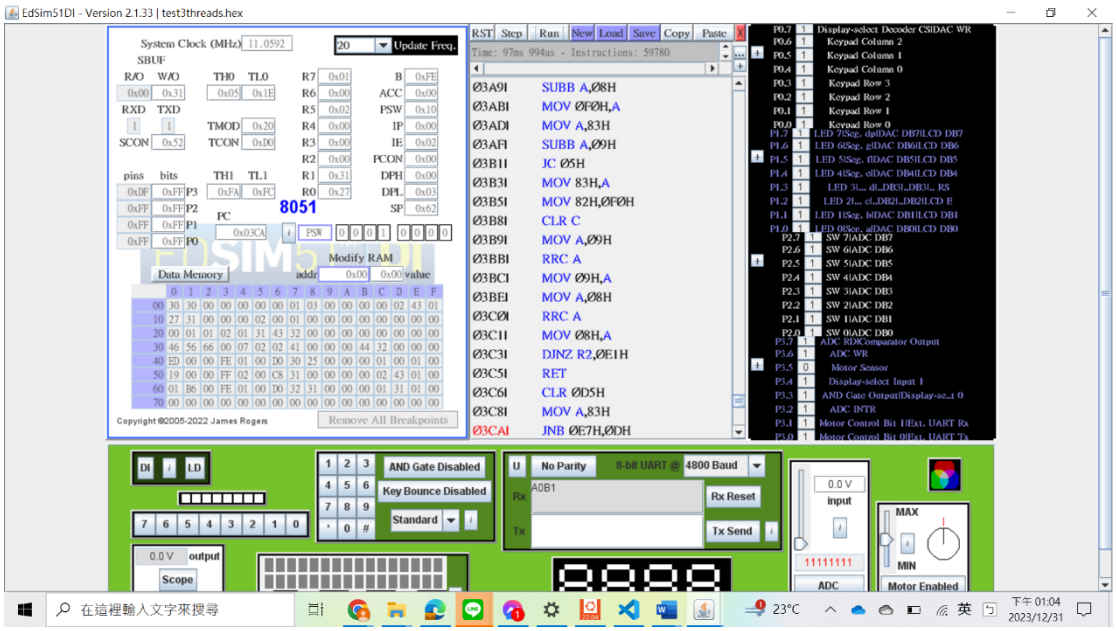


Producer2 is running. The ‘cur_thread’ in 35H is 02 now. (Producer2() is thread 2)

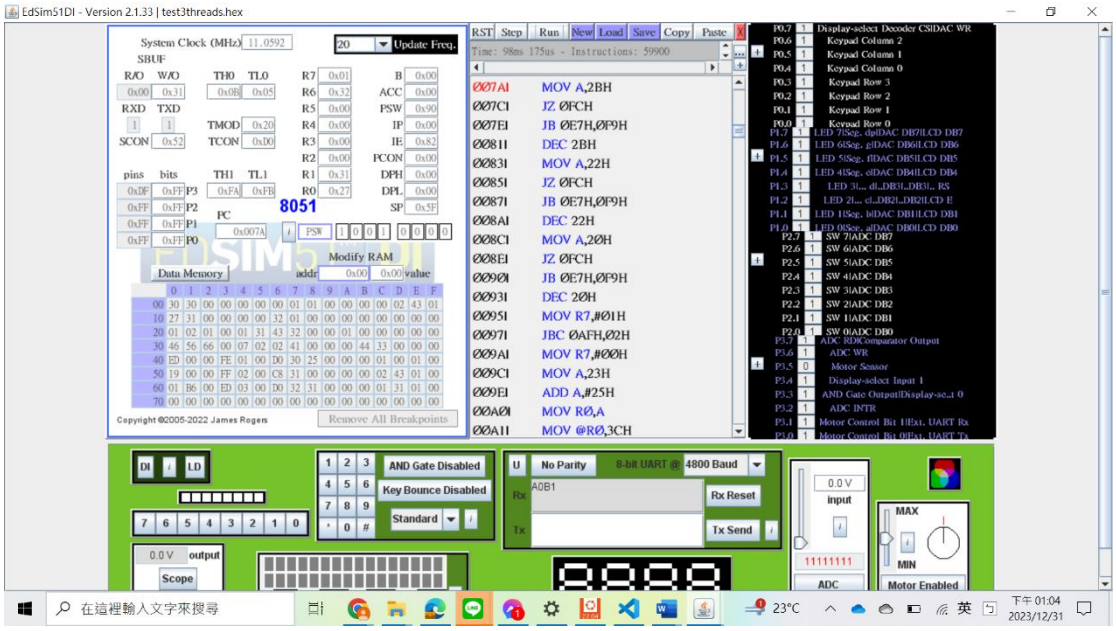
At first, ‘empty’ in 22H is 3, and ‘mutex’ in 20H is 1, and ‘turn2’ in 2BH is 1.



The semaphores, ‘mutex’, ‘full’, ‘empty’, ‘turn1’, and ‘turn2’, are changing.

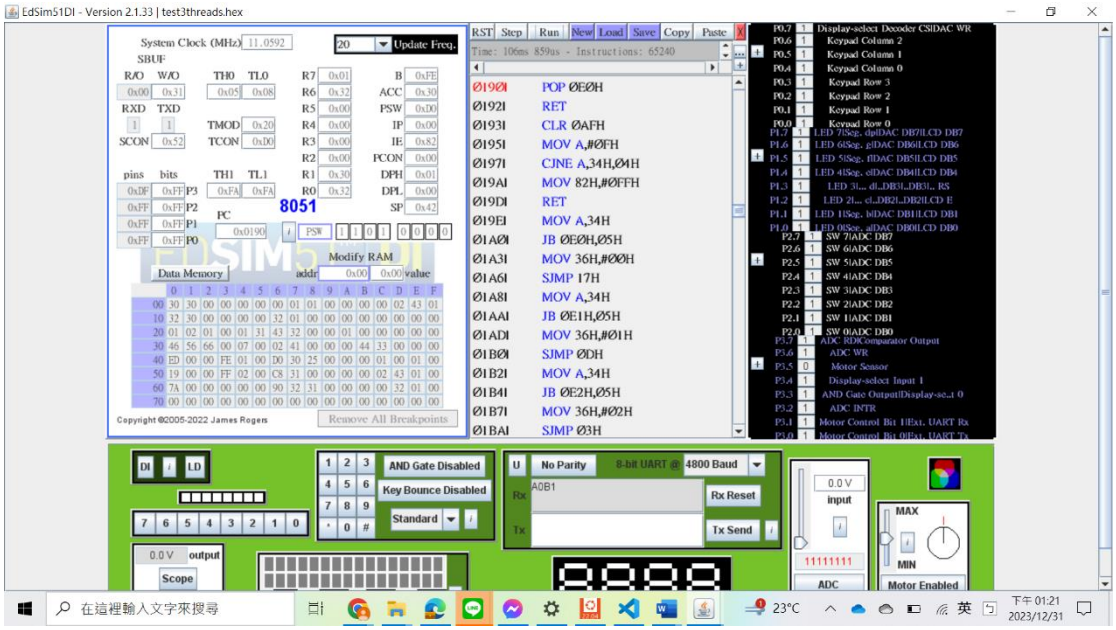


The ‘mutex’ changes to 0 and returns to 1 in the end. The ‘full’ turns to 2 in the end, and ‘empty’ turns to 1 in the end. Also, ‘turn1’ in 2AH turns to 1, and ‘turn2’ in 2BH turns to 2.

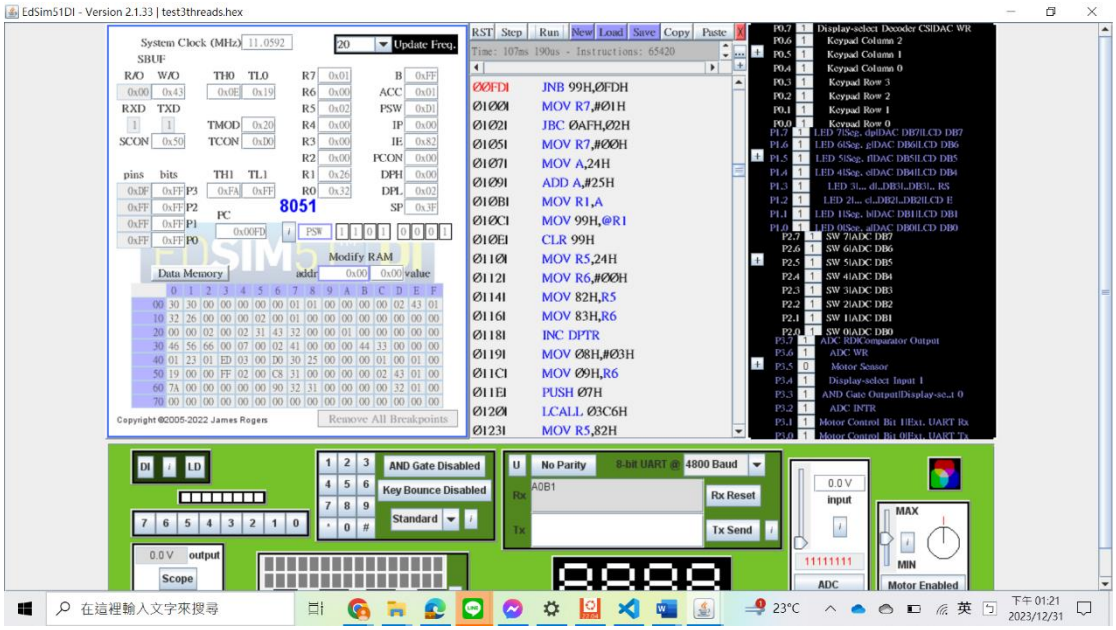


Consumer is running. Since ‘cur_thread’ in 35H is 0.

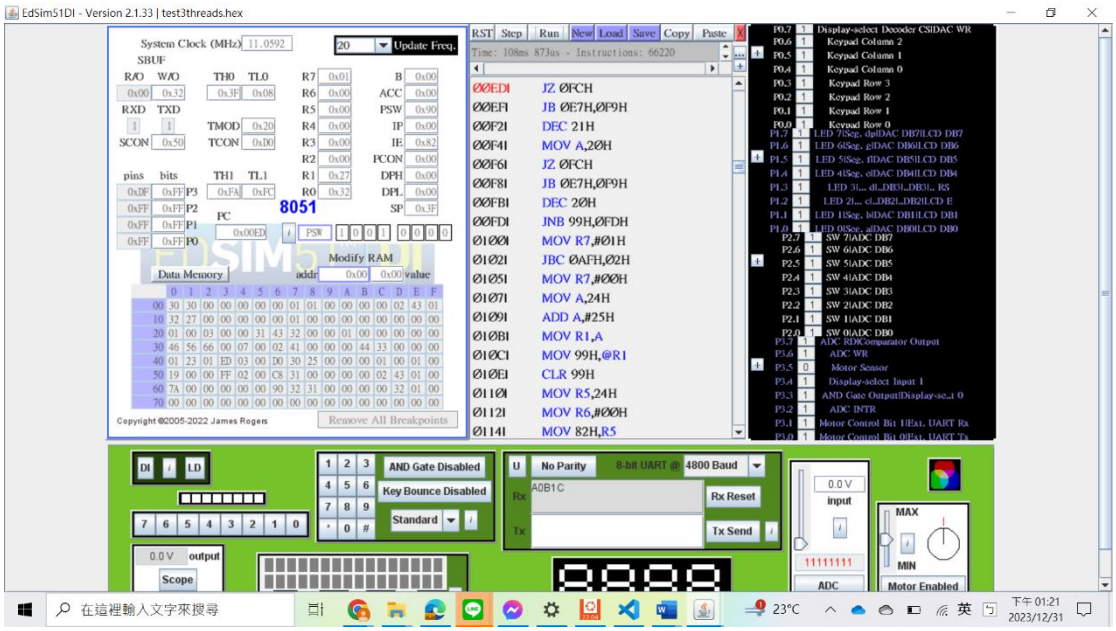
At first, ‘mutex’ in 20H is 1, ‘full’ in 21H is 2, and ‘empty’ in 22H is 1.



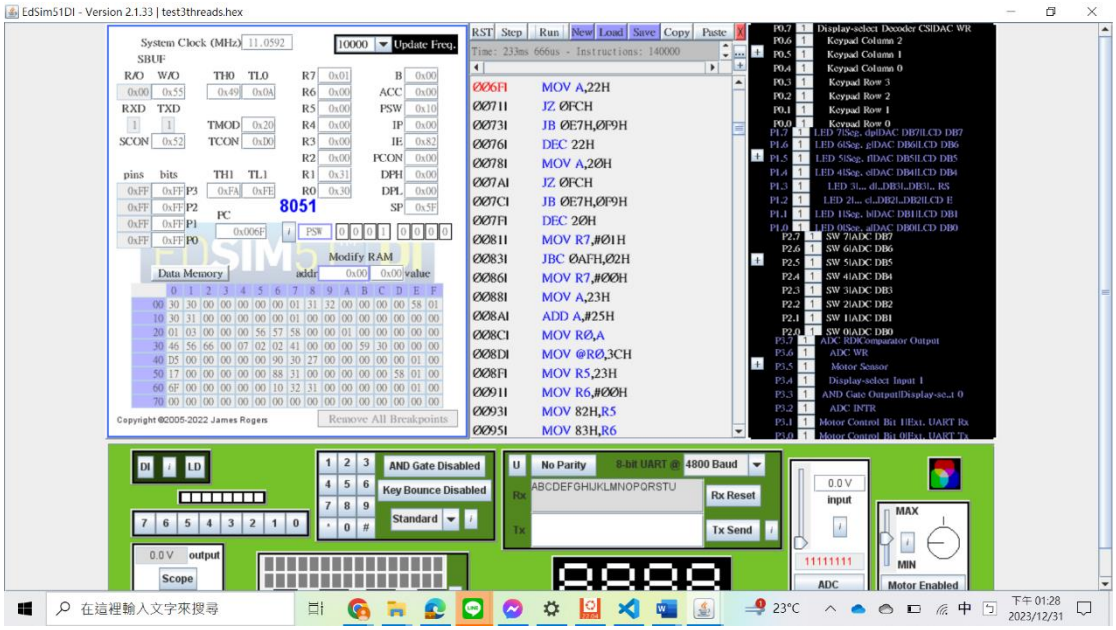
The semaphores, ‘mutex’, ‘full’, ‘empty’, ‘turn1’, and ‘turn2’, are changing.



The ‘mutex’ turns to 1, ‘full’ turns to 0, and ‘empty’ turns to 3 in the end.



The unfair version. Only the product of producer1 will become the UART output. Since ‘empty’ turns to 0 by producer1, producer2 will wait for ‘empty’ to become > 0 forever.



Fair version. Since there exists ‘turn1’ and ‘turn2’, every producer can only put 1 product onto the stack.